approach

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A COLLECTION OF MIDAIRS

Early sighting of aircraft in close proximity to your own is important in avoiding midair collisions. In enemy skies, a sharp pilot can achieve additional longevity by using this forewarning to get in an advantageous position for making an attack.

By COL. J. H. Reinburg, USMCR

Flying high speed military jet aircraft is no small job. Pilots must divide their attention between cockpit duties and constant scanning of the skies for other aircraft. Cockpit manipulations and instrument observations require precise attention particularly during the takeoff and landing phases. But even then, scanning outside the cockpit can not be neglected.

On deck and taxiing back to the line, or once cleaned up and comfortably airborne after liftoff, the cockpit duties slack off. But all too often in the air, a tendency arises on the part of some pilots to assume that the sky is theirs alone. Here are some condensed versions of midair mishaps that demonstrate that such is not always the case.

Internal Noise Distraction

A T-2A was on a basic instrument training flight. While climbing through 15,000′, the instructor pilot noticed a noise that seemed to come from the after fuselage. Its intensity increased in the climb, so at 16,500′ the instructor took the controls from the student, turned toward home base and commenced a shallow descent. Almost immediately, the noise

quit. All instrument readings remained normal so the crew decided that the annoyance had come from the non-critical air conditioning system. The instructor decided to continue the hop so he turned the controls back to the student.

The Big but not so Empty Sky

Meanwhile a section of T-33s were in the area practicing combat tactics. The *Buckeye* instructor suddenly observed two *Shooting Stars* very close above and converging at right angles just as he made the decision to continue the flight. Realizing that the proximity of the T-33s was dangerous, the instructor took the controls from the student, pushed the throttle up to 100 percent and rolled hard left.

This action was not quick enough and the underside portion of the second T-33's empennage smashed into the underside of the *Buckeye's* port wing. The T-2A immediately became uncontrollable and the instructor initiated dual ejection. The instructor ejected successfully but his student was struck and fatally injured by the falling *Buckeye* before his chute deployed.

Continued

Evasive action was too late.

The T-33 initially became uncontrollable but the pilot was able to level it off after losing quite a bit of altitude. He ultimately determined that a safe landing could not be accomplished, however, and both occupants ejected successfully.

This very unfortunate accident is another case of complacency in the big and "empty" sky. The weather and visibility were good so it is just a pure case of lax visual observation on everybody's part. The T-2A crew was naturally distracted while they investigated a strange noise. But the student failed to keep up a proper scan while the instructor flew the aircraft. If he had followed the proper lookout policy, the section would have been detected sooner. The T-33 pilots must also share the blame.

Twenty Eyeballs Failed

After finding their primary ground target in a joint service exercise saturated, the leader of a flight of six A-4Cs decided to proceed to their secondary target. The change of plans was coordinated with and approved by their assigned GCI station. At the same time, another GCI station was controlling a division of four F-86 aircraft in an overlapping area. Unfortunately, however, the two ground stations were not coordinating with each other.

The *Skyhawk* leader led his flight, in loose column formation, over the secondary target for identification and traffic purposes. No other aircraft were observed in the area. The four *Sabres* were nearby at a higher altitude and were the first to sight the *Skyhawks*. Feeling the spirit of the joint maneuver would condone a simulated aerial engagement, th *Sabre* leader set his sights for an attack on th number 4 *Skyhawk*. He thought he was picking o "Tailend Charlie" because he had failed to se numbers 5 and 6 in the extended and staggere column.

In his diving attack the lead *Sabre* pilot had t pull 8G in order to hold the pipper on the number *Skyhawk*. Obviously, this was not conducive to goo vision and he didn't even see his starboard win gouge the port side of the number 5 *Skyhawk*. Fo tunately, both aircraft were able to maintain leve flight and both later made safe landings.

An 8G gouge by the *Sabre*.

Three-Dimensional Search Responsibilty

Even though joint maneuvers such as this are often conducted under GCI control, there is no substitute for continuous personal vigilance in the cockpit. Combat maneuvers are designed to simulate hostile conditions, and for his own protection every pilot's head should be on a swivel. Obviously, the *Skyhawks* were in a poorly deployed position to be on the lookout for "enemy" air attacks because at least one of the six pilots should have spotted the 86s. The *Sabres* had the altitude, and therefore, every advantage. Regardless, they were too quick to assume that only four planes were below. Collision avoidance in VFR conditions is dependent upon heads-up flying for all crews in all situations.

Head-on at 1200-plus Knots

Three F-4Bs were on an air combat maneuvering mission under the watchdog eye of a GCI station. The purpose of the flight was to introduce the three *Phantom II* replacement pilots to offensive section tactics against a single bogey.

One of the F-4s was assigned the bogey role and the other two took their turns on the offensive. With GCI assistance, the two attackers, in loose section, were lined up for a head-on attack on the bogey. At about 20 miles, lead broadcast his "Judy" and, according to plan, continued to close in order to identify the bogey as an "enemy" target. The "Judy" was also a signal for the wingman to barrel-roll in order to let the lead get three miles ahead.

As briefed, when lead got his identifying visual on the bogey he transmitted, "Bandit, bandit, bandit. Cleared to fire." This was the signal for the wingman to simulate a *Sparrow* shot at the bogey. Then lead was to safely get out of the way as quickly as possible and protect the wingman while he fired the missile.

The exercise called for the missile to miss, then the bogey pilot to try for a tail shot at either of his attackers. After identifying and passing the bogey, lead turned hard starboard. A few seconds later, the wingman passed close aboard the bogey then wrapped it up into a high-G port turn. The bogey pilot, meanwhile, strained himself into a starboard reversal. One can quickly visualize that the wingman and the bogey had set themselves up on the same race track going in opposite directions and the high-G turns did not help them maintain visual contact.

Blindman's Buff

The bogey pilot immediately lost sight of the attacking wingman but his RIO was able to keep him informed of the other *Phantom II's* position. The wingman had visual contact with the bogey in the turn but lost sight of him when the profile changed to head-on. In spite of the nose thin aspect, the bogey pilot picked up his adversary but thought he was set up for a tail chase shot. He concentrated on lining up his gunsight reticle on the other *Phantom II*, thinking that he had plenty of time. Unfortunately, about six seconds were left for one pilot to avoid the other; very little time for human reactions. Fortunately only the wings sliced each other and no damage occurred to either fuselage. Both crews were able to eject safely, but two expensive planes instantly left the inventory.

There have been several midairs of this type lately. The combination of reduced vision because of the high G forces, wide turning radii and fast closure rates leave little time for errors and possible corrections once the other aircraft comes into view. The combat tactics which sometimes lead to these midairs must be part of each fighter pilot's training, and squadron briefings must anticipate such potential trouble.

Look Before Turning

The sky, being three-dimensional, tends to swallow up aircraft. One can often fly for hours at a time without ever seeing another airplane on our so-called crowded airways. Then, all of a sudden, as if by magic, another aircraft appears and a near-midair or actual mid-air occurs. A midair of this type occurred between two flights in the training command.

A flight of three T-2As was practicing breakup and rendezvous maneuvers at 17,000′. Another flight of five *Buckeyes* was in the same area and at the same altitude practicing parade formations. Apparently, the two lead pilots were engrossed in leading smoothly and the wingmen were concentrating on holding good positions.

The leader of the three-plane formation thought his two wingmen looked settled down in a steady right echelon and ready for another snappy break so he gave the head-hand signal. Off he went to the left as if he owned the sky and, therefore, had no

Tip tanks and . . .

. . . horizontal stabilizers do not mix.

need to make sure all was clear in the direction he planned to go.

Well, all was not clear and the two flights intermingled like they were having a real combat dogfight. The instructor in the number 5 plane grasped the situation and yelled over the tactical frequency, "—Flight, pull-up, pull-up!" This very likely prevented one midair but another resulted anyway. The leader of the three *Buckeyes* dragged his right horizontal stabilizer through the right wing tip tank of the number 4 aircraft in the other flight. By a miracle, the other *Buckeyes* threaded safely through each other's formations.

Inflight checks proved that the two damaged aircraft were still controllable and both pilots landed safely at home base.

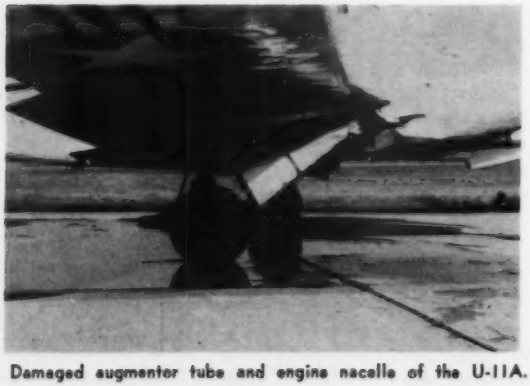
Who was looking where? The biggest safety lesson here is look *before* you turn. And, if you are leading a formation, your scan has to serve for all the other pilots whose eyes should be glued to you, the leader.

Flying Into the Sun

In actual combat, using the sun to hide from the enemy aircraft is a good trick. In non-combat operations, however, old Sol restricts good vision in his direction and occasionally contributes to a midair.

A U-11A received clearance from the tower and took off on a standard route for VFR traffic. The ceiling was unlimited with seven miles of visibility, and the direction of climbout was into the morning sun. Several minutes later a T-33 was cleared for takeoff from the same airport on a simulated IFR clearance. While climbing, the two *Shooting Star* pilots were preoccupied in their cockpits trying to comply with departure control instructions. Their climbout was also in an easterly direction.

Suddenly, at about 4,500′, the pilot in the front seat of the T-33 looked up and saw the silhouette of an airplane directly into the sun. At this first sighting, the distance between the aircraft was only about 20′, and at a relative overtaking speed of over 100 kts there was little time for collision avoidance. The T-33 shot beneath the *Aztec's* right wing dragging its rudder under and into the wing and right engine nacelle.



Damaged augmentor tube and engine nacelle of the U-11A.

Fortunately, both aircraft were able to remain airborne and safety of flight checks were conducted successfully. Both the little twin engine transport and the T-33 got back to the airport safely.

The Overtaking Aircraft Is At Fault

Since the T-33 came up behind the *Aztec*, its pilots were the guilty parties according to FAR. The *Shooting Star* was on an IFR clearance and a certain amount of complacency may have entered the lookout policy of the two pilots. They departed under radar control and therefore may have *assumed* that this would keep them clear of all other aircraft.

Simulated IFR flights in VFR weather are always good practice and make for better performance in actual bad weather. Pilots must remember, however, that good weather entices unpredictably large numbers of aircraft into the skies, most of which fly at altitudes and in directions unpredictable by ATC. Accordingly, pilots on IFR flight plans in actual VFR weather must work harder than they would if they were totally in the soup. This is because they must, in essence, operate by both Instrument and Visual Flight Rules. Constant visual observance is mandatory. And, when flying VFR directly into the sun, it would be wise to fly a slightly zig-zag course to be doubly sure that a potential collision is not hidden in that difficult viewing spot.

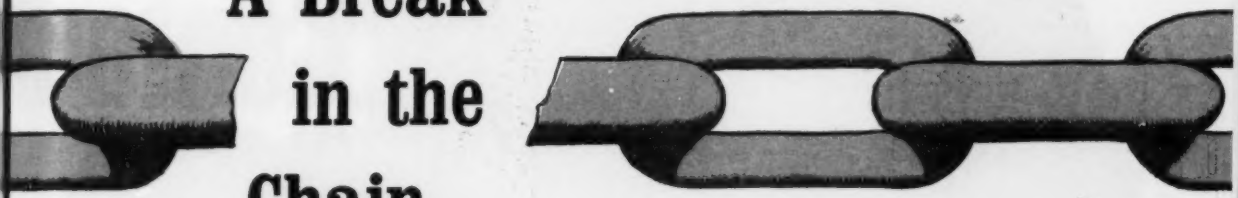
Some Basic Recommendations

All of these mishaps were basically caused by the plain fact that the pilots did not see each other until it was too late to avoid a collision. In the case of the *Phantom IIs*, the high rate of closure left too few seconds between the time of possible sighting and the actual midair. Some others let cockpit preoccupation take precedence and one ignored possible sun blanking. The *Buckeye* formation pilots let internal position concentration overshadow normal lookout requirements. The *Shooting Star* and *Sabre* pilots let maneuver realism take precedence over adequate and constant visual observations.

No flat rules can be made for sure midair prevention, but continued alertness and emphasis on the following will help.

1. Lookout doctrine tailored to type formation.
2. Closure rates tied to maneuver characteristics.
3. Visibility, clouds, sun, time of day (night).
4. Aircraft attitude, speed and type of mission peculiarities.
5. Radio availability and usefulness. ◄

A Break in the Chain



As daylight faded, the pilot of an A-4B began his sixth attempt since 0800 that day to get airborne. His first five attempts had been aborted due to mechanical difficulties encountered on two different aircraft, and a required change in flight plan.

After the first three abortive launch attempts, the first aircraft had to be downed and a second aircraft assigned. The new *Skyhawk* was preflighted and the pilot manned the aircraft at about 1500. After a normal preflight and start, the hydraulic gage in the starboard wheel well ruptured. The aircraft was shut down and the pilot vacated the cockpit area after installing the seat and canopy safety pins. The hydraulic gage was replaced and a normal preflight and start was again conducted. After start, a hydraulic leak was detected in the vicinity of the new hydraulic gage and the aircraft was again shut down. The pilot again vacated the cockpit area after reinstalling seat and canopy safety pins.

By this time it was past the normal closing time of the facility, but for this one final attempt to get the aircraft launched, the Operations Duty Officer kept the field open. The hydraulic leak was corrected, and with time now a factor, the pilot apparently performed a hasty and incomplete preflight.

With the pilot in the cockpit, the plane captain removed the ejection seat catapult safety pin and the aft canopy jettison initiator safety pin. The plane captain then draped the cloth connecting streamer over the starboard cockpit sill with the pins outboard. In his haste, coupled with the break in his normal habit pattern (of removing the pins himself), the pilot neglected to remove the remaining canopy jettison safety pin. After start, the canopy was closed over the red cloth connecting streamer and the aircraft departed the line.

After takeoff the pilot discovered that the safety pins and a portion of the red cloth streamer connecting pins were dangling free in the airstream. He immediately reduced throttle for minimum safe airspeed, turned downwind and landed. Prior to touchdown the airstream shredded the cloth streamer just outboard of the canopy. The cloth streamer and all of the pins were ingested by the engine through the starboard intake duct. Engine indications remained normal and no unusual vibrations were noted after the pins were ingested, but minor damage resulted to the engine nevertheless.

A break in the chain (checklist) often sets the stage for an accident. In this case, a mature, conscientious and experienced pilot, not new to operations of this type, allowed himself to be placed in a hazardous situation by failing to make a complete preflight inspection, even though he went over the checklist several times in the same aircraft prior to the launch.

One other opportunity to break the chain of events and prevent this incident was lost when the line crew took no action to inform the pilot of the situation. After the incident occurred, several of the ground personnel reported having seen the red cloth streamer hanging from the starboard side of the fuselage after start, but they made no attempt to warn the pilot since they assumed that he would remove the pins prior to taxiing.

Safety is everybody's business and besides re-emphasizing the need for adherence to NATOPS procedures and checklists, it should be stressed again to ground handling personnel that positive action on their part *can* prevent accidents. ◄

Radar Contact

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By

Complacency

The flight started out as a normal training hop. It was scheduled to be four hours of night instrument work. A student pilot took the left seat, while an instructor pilot rode shotgun. The instructor pilot was well qualified in S-2 aircraft. Start, taxi, engine checks, simulated and actual IFR clearances were completed. The weather was forecast to be CAVU. Takeoff and climb checklists were completed and the pilots settled back. Weather was as predicted as they commenced the first leg of the round robin.

Approximately 30 minutes later, Delta Center called "radar contact." Three or four radar traffic advisories were issued from the center with a pilot response of "No joy" after each call. Following this, charts were studied and simulated emergencies were performed in the cockpit. A short time later the aircraft was transferred to another center and again "radar contact" was reported.

The pilots felt quite secure and were completely relaxed (no, they weren't asleep). In the next instant, they heard a loud noise and a bright light flashed past the cockpit.

"What was that?" shouted the student pilot.

The instructor pilot was slightly shaken and didn't answer for a few moments. Then both pilots realized that they had just had a near-midair with a jet type aircraft.

The center was notified and the IP reported a near-midair.

The remainder of the flight was uneventful. The pilots landed and filed the necessary Near-Midair Report.

Results of the investigation later proved that a *Phantom II* had been cleared to take off and intercept the 010 radial with a *right* turn. The runway was 06. The pilot commenced takeoff and executed his climbout with a *left* turn. This set the stage for the incident described above. The pilot of the *Phantom II* was given a flight violation.

Lessons to be learned are obvious. Always follow your clearance. Beware of unusual clearances. Accept and reflect upon what you have been cleared to do. The pilots of this S-2 will certainly not rely on "radar contact" to remove any of the burden from them of keeping a proper lookout. *Regardless of the type of flight plan, pilots are never relieved of their responsibility to maintain a lookout for other traffic and should be particularly alert when operating in VFR weather conditions.*

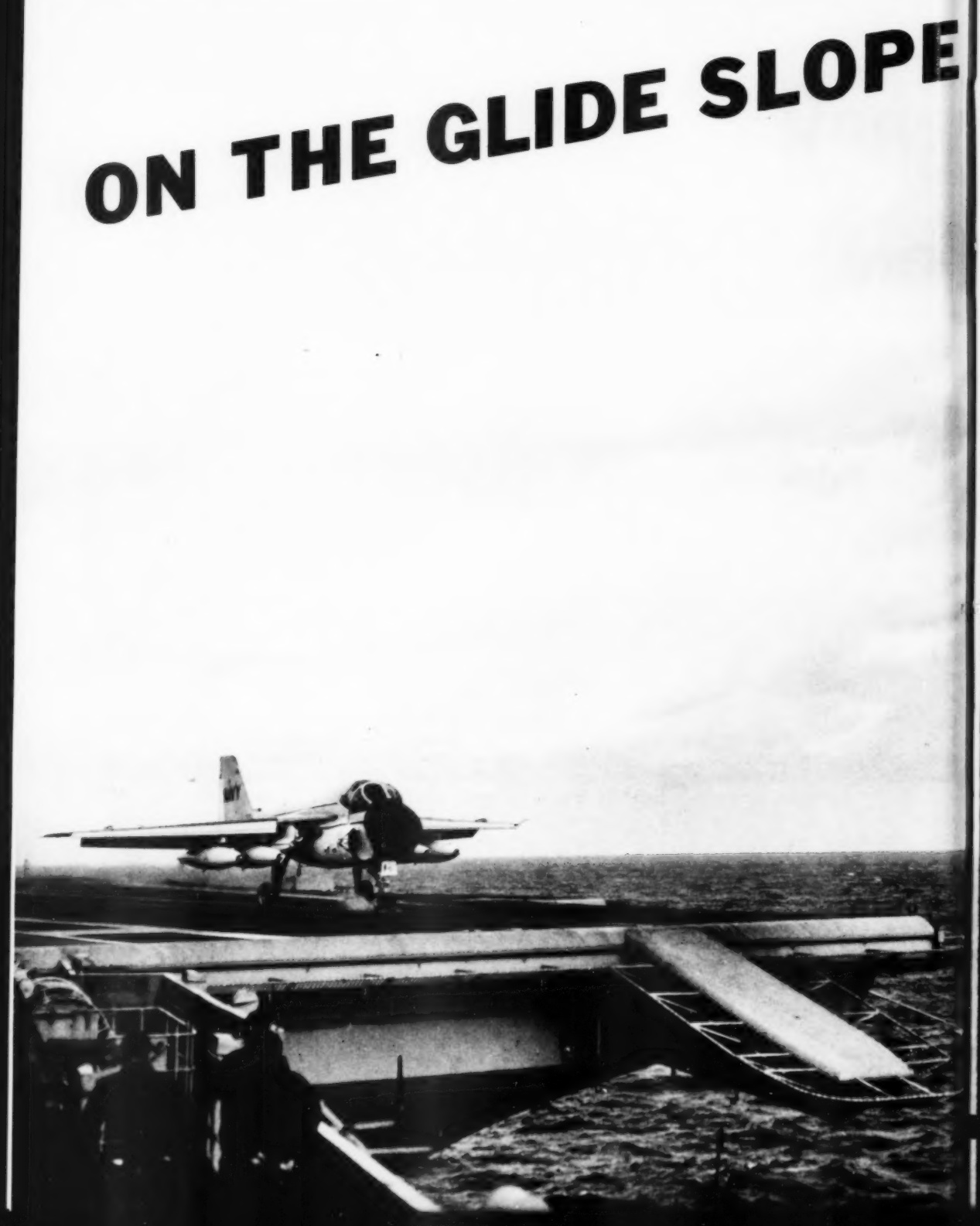
Pilots tend to forget that all traffic information cannot be given. Some traffic may not be picked up by radar. Other traffic may not be seen by the controller in time to give advisories; or the controller may be actively engaged in separating IFR traffic and cannot give an advisory.

This incident could have resulted in the death of three pilots and the loss of two aircraft.

Don't *you* be a victim of "Radar Contact Complacency!" ◄

By LT(JG) N. Robertson, VP-49

ON THE GLIDE SLOPE



The Squadron Instrument Training Program

In recent years a considerable amount of material has been published concerning instrument flight and the applicable formal training programs. Emphasis in the training phase is generally placed on the Naval Air Training Command syllabus and the various Replacement Air Wing programs. While these are excellent, they must not be regarded as the final stages in instrument training for any naval aviator, for formal courses do not ensure continuing proficiency once the syllabus has been completed.

It is the responsibility of every command and every naval aviator to continue instrument training to a reasonable extent within the operational squadron.

Many fleet squadrons have a requirement for their aviators to attend a formal instrument course at least once a year. This is often not feasible due to deployment schedules or the nonavailability of instrument school quotas; and as a result the squadron itself must bear the responsibility for instrument training. With a little forethought, the operations officer can incorporate sufficient instrument refresher flights in the normal operational schedule to maintain all squadron aviators at a high level of proficiency.

The amount of actual training necessary will vary with the number of instrument hours flown per pilot per year. Another key factor is the area in which the squadron generally operates. A VP aviator operating in the Pacific Northwest, for example, will log a considerable number of actual instrument hours per year, and he should be very proficient in airways procedures. Carrier pilots fly a high percentage of actual instrument hours; however, they are sometimes not exposed to airways procedures for considerable periods of time. Some other squadrons are concerned primarily with VFR operations and their pilots log instrument time for proficiency purposes only. These factors must be taken into account when preparing a squadron instrument training program. The training must be designed to emphasize those areas in which pilots receive the least normal exposure.

The instrument training program should include ground and flight phases. The ground training program may be carried out during normal all pilots meetings and the flight phase can be incorporated into the normal operational schedule.

Ground Training

The ground training phase may be conducted by the squadron navigation/instrument officer. It should include normal and emergency procedures, and changes in ATC procedures as they occur. By attending the complete ground training course at the nearest instrument RAG, the instructor can be updated periodically on teaching methods and he can obtain a suitable set of lecture outlines for his squadron program. Subjects of importance are:

1. Weather/flight planning
2. Enroute procedures
3. Terminal procedures
4. Local course rules and instrument procedures

These lectures should be tailored to the needs of the squadron. The instructor should bear in mind that the pilots attending are fully qualified aviators and that the material he presents should serve as a review—to emphasize procedures pertinent to squadron operations. In addition, the navigation officer should ensure that suitable study materials for the

type command instrument examination are available. Those study materials should include:

1. FLIP Planning Document, Sec II
2. OpNavInst 3710.7D
3. FLIP IFR Supplement
4. Low Altitude Enroute Charts
5. High Altitude Enroute Charts
6. FLIP High or Low Altitude Instrument Approach Procedures
7. NATOPS Instrument Flight Manual

The footnote section of the daily flight schedule is an excellent place to get word of procedures changes to all pilots in the shortest possible time. The Special Notices section of the IFR Supplement, changes in the Pilot Procedures section of Sec. II, FLIP Planning Document, NOTAMs affecting facilities utilized in squadron operations and local NAS Operations Newsletters should be screened upon receipt by the navigation officer. Applicable portions thereof should be added to the footnotes. If discussion is required, it can be brought up at the next all pilots meeting.

Deploying squadrons should ensure that adequate instrument procedures briefings are held prior to commencing any deployment. Emphasis should be on operating station/ship course rules and instrument approach capabilities, ICAO procedures, divert field facilities and area weather characteristics. In addition, each pilot should be issued sufficient navigation publications to orient himself, well in advance, with the deployment operating area.

Flight Training

The flight training phase should follow a master schedule, with the instrument work incorporated into regular operational flights as much as practicable. A member of the instrument board should act as copilot or chase. A recommended semiannual schedule would be:

Instrument Training Plan

1. DD-175 IFR Cross Country—Terminate at home station.
2. DD-175 IFR Cross Country—Terminate at other than home station.
3. IFR Round Robin—Include published approach to missed approach at outlying field, at least 2 GCAs at home station. (At least one missed approach at home field).
4. IFR Round Robin—Include published approach + 2 GCAs at outlying field, 2 GCAs at home station.
5. Local IFR—Includes SID, primary published approach to home station, alternate published approach to home station, 1 ASR, 1 no-gyro GCA, 2 normal GCAs.
6. Normal operational flight—Termination with published approach, 1 GCA to home station.
7. Normal operational flight—Termination with enroute descent, 1 ASR to home station.
8. Normal operational flight—SID departure terminating in alternate published approach to minimums, missed approach and no-gyro GCA to home station.
9. Normal operational flight—Published approach to missed approach at outlying field. Published approach plus GCA at home station.
10. Instrument flight check (if required)—SID, basic airwork, airways navigation, published approaches (preferably one to an outlying field). Ref: NATOPS Instrument Flight Manual.

The minimum annual requirements for a naval aviator to maintain a Standard or Special Instrument Rating are:

If you have any questions regarding instrument flight procedures, send them to:

Commanding Officer
VA-127
NAS Lemoore, Calif. 93245

The instrument training program is only a guideline to ensure that every squadron pilot has sufficient opportunity to retain proficiency.

1. Within the preceding 6 months:
   (a) Ten hours as pilot under actual or simulated instrument conditions, or
   (b) Twelve penetrations/approaches as pilot, under actual or simulated conditions which include a descent from enroute or initial penetration altitude and transition to an ADF, VOR, tacan, PAR or ILS final approach to field minimums. These may be substituted for 10 hours instrument time, provided at least three are flown under actual instrument conditions. When this substitution is exercised, however, penetrations/approaches so used may not be applied toward requirements listed in (c) and (d) below.
   (c) Six actual or simulated penetrations or approaches (ADF, VOR, tacan, range) to field/ship minimums.
   (d) Six actual or simulated precision (ASR, PAR, ILS) approaches.
2. Within the preceding 12 months:
   (a) Twelve precision (ASR, PAR ILS) approaches under actual or simulated conditions.

The above-mentioned annual requirements are minimums for an operational fleet aviator. Additional training must be provided so that every squadron aviator may qualify, from an all weather standpoint, to perform any of the operational missions assigned.

The instrument training program is only a guideline to ensure that every squadron pilot has sufficient opportunity to retain proficiency. In most cases, an aviator will fly the flights mentioned above on a semi-annual basis and additional scheduling strictly for instrument training will be unnecessary.

Regarding the approaches, each pilot should execute all of the applicable approaches to home station at least once during the semi-annual period. In addition, all published approaches should be carried to minimums frequently so that pilots will not become accustomed to relying strictly on radar for final control. Proper execution of an ADF or VOR approach demands a high degree of proficiency to carry it successfully to minimums. Section approaches should be executed as frequently as practicable for proficiency in the formulation aspects of the approach as well as the instrument phase.

In the event that home station does not have a GCA, a suitable outlying field must be used for concentrated ASR/PAR work. By executing multiple GCAs at the terminal field on cross-countries, the requirement for additional GCA hops can be eliminated.

Flights scheduled for instrument training should be thoroughly briefed and whenever practicable, emergency procedures should be practiced. Emergencies should include loss of navigation aids, lost communications, emergency approaches and additional situations applicable to the equipment flown. At the termination of the flight a thorough debriefing, covering all aspects of the flight, is essential.

Most squadrons will have a designated Instrument Flight Board. The members should be utilized in an instructional capacity whenever possible. All members must be highly qualified in type, should hold Special Instrument Ratings, and most important, they should be available to fly the necessary flights.

When a flight is scheduled for refresher purposes, the instrument work should be challenging enough to maintain a high level of interest among the pilots involved. Instrument training should be a continuing process throughout the pilot's operational tour. Reliance on a formal course taken once every year or two is not sufficient to maintain currency. The ability to effectively perform in an instrument situation is equally as important as a 3-wire carrier pass. Often, the former is an absolute prerequisite to accomplishing the latter.

Mk 13 Mod 0 signals

by R.T. Frothingham
Naval Ammunition Depot, Crane, Ind.

Because of an inflight incident involving the accidental ignition of pyrotechnic signals contained in the pockets of mae west life preservers, the Naval Ammunition Depot (NAD), Crane, Ind., has conducted a series of tests to determine the probable effect of external heat on such equipment.

An SP-2E aircraft, carrying 12 men, was flying from NAS Memphis, to NAS Los Alamitos. Since no part of the flight was to be over water, the mae wests were not being worn; instead they were piled in the after cabin of the plane. The man who piled them was either unaware that each contained two pyrotechnic Mk 13 Mod 0 day-night distress signals or he did not know that pyrotechnics will burn if subjected to heat. In any event, the 12 mae wests were placed in front of the after cabin heater, directly in line with its 330° to 380°F air blast.

Over eastern New Mexico, at an altitude of 12,000′, the smoke composition in at least one of the signals ignited, and the resultant conflagration quickly ignited both the smoke and the flame composition of all 24 of the signals.

The pilot was able to make an emergency landing at Albuquerque and the blaze was soon brought under control. Fortunately, no one was seriously injured and damage to the aircraft was relatively minor. *(See "Pop Go the Flares," April, 1967* APPROACH.—*Ed.)* This incident serves, however, to emphasize some rather important areas of apparently insufficient knowledge. It seems to indicate that there is a definite and very dangerous lack of awareness among some members of the Armed Forces as to the essential hazards inherent in pyrotechnic munitions. It also points up a shortage of precise information as to the effect of externally applied heat on pyrotechnics in general and the Mk 13 Mod 0 distress signal in particular.

Information of this type should be wholly academic for all normal handling of pyrotechnics. OP 4, Ammunition Afloat and OP 5, Ammunition Ashore both clearly specify that pyrotechnics shall be stored at temperatures not exceeding 100° F. OP 2213, First Revision, states, a bit more realistically, "that every reasonable effort should be made to maintain storage temperatures at not more than 100°F."

Storage people are fully aware of the dangers and without a doubt they try very hard to keep the heat down in magazines and other storage facilities. The big trouble, though, seems to be widespread feeling that, once a pyrotechnic device is removed from a recognized standard storage condition and becomes attached to or is made a part of a garment or a life raft, the rules no longer apply. The painful truth is that the same temperatures will ignite pyrotechnics no matter where the pyrotechnics happen to be.

NAD, Crane, tested a number of Mk 13 Mod 0 distress signals from five lots and three different manufacturers (Crane, Kilgore, and Aerial Products). Differential thermal analysis was conducted on each composition taken from disassembled signals from each of the lots to determine its ignition temperature. These analyses produced the information given in Table I.

Since the cabin heater in the SP-2E incident de-

s can be fire hazards!

Table I

Ignition Points of Distress Signal Mk 13 Mod 0 Components

Component	Ignition Temperature (°F)
Dust meal	824
Starter button	752
Firecracker fuze	410
First-fire composition	752
Smoke composition	347
Flame composition	752
Pull wire igniter	652

veloped temperatures ranging from 330° to 380°F, it is clear from the above table that only the smoke composition would ignite in the environment experienced. It was believed, however, that the presence of the other various chemical ingredients within the signal case might have an effect upon the ignition temperature of the smoke composition.

As a consequence of this belief, complete units were subjected to heat-soaking in an oven, the temperature of which was carefully monitored by a thermocouple attached to a recorder. Each unit was placed in the oven at an initial temperature of 200°F, and the temperature was raised approximately 10°F every 15 minutes. Four Mk 13 Mod 0 distress signals were thus tested. The results are given in Table II.

From this it would appear that the Mk 13 Mod 0 day-night distress signal (more formally, the marine smoke and illumination signal, Mk 13 Mod 0) almost certainly will ignite if it is subjected to a temperature environment of from 260° to 330°F for a period of 10 to 15 minutes. 13

The conclusion, therefore, is that all personnel who in any way handle mae west life preservers must be cautioned that this gear contains pyrotechnic signals, that all pyrotechnics are expressly designed to burn and that they must not store or place mae wests in any location or condition where there is even the remotest possibility of their being subjected to abnormal temperatures.

Table II

Heat-Soaking Tests of Complete Distress Signals Mk 13 Mod 0

Lot No.	Manufacturer	Smoke Composition Ignition Temperature (°F)	Time to Ignite (approx min)
53, HK-12-62, 195	Kilgore	280	10
19, 9-60	Kilgore	325	15
121, C-56	Crane	265	15
169, A-53	Aerial Products	275	10

—Naval Ordnance Bulletin 2-67

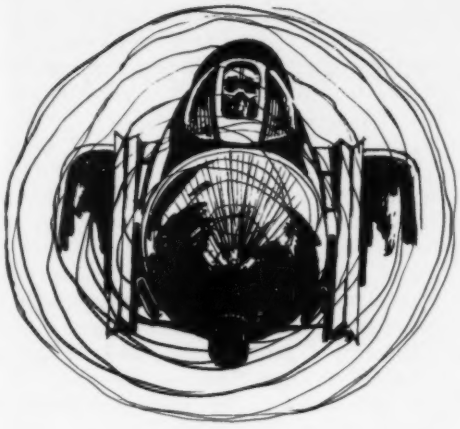
ROTATIONAL EXTRAVAGANCE

Many spin accidents are fatal, but in the event to follow, the crew of an F-4B survived to add some very informative reports.

". . . The next maneuver I planned to do was a max performance climb to 40,000′, with an unusual attitude recovery. I neglected to mention it earlier in this narrative, but before leaving on the flight, the procedures for performing this maneuver had been thoroughly explained to me by a qualified squadron instructor pilot and also the squadron ASO. My understanding of the maneuver was as follows—I was to accelerate in level flight to 400 KIAS in basic engine, then light the afterburners and rotate to a 45° nose-up attitude. At 25,000′ I was to come out of afterburner, leave the aircraft in full military at 45° nose-up and as the aircraft reached 250 KIAS commence a 5-10 unit angle of attack recovery. It was explained to me that the aircraft would probably peak out at about 40,000′ and that recovery would be complete at about 30,000′. The unusual attitude recovery had been demonstrated to me on my fam demo hop and I had performed it on my fam II without difficulty. I had a full understanding of the methods of performing the maneuver, and had no apprehensions about doing it nor about my ability to do it.

"As we approached the coastline I was at 15,000′, and saw no reason to descend to 10,000′ to initiate the max performance climb. (The fam-4 brief card called for a 10,000′ initial altitude.) I explained to my radar systems operator (RSO) that we would have to be 3 miles out to sea before going above 24,000′. Then I accelerated to 400 KIAS at full military, lit the afterburners and rotated the nose. I initially was looking for the nose attitude indication on the ADI, but then realized that it was the standby attitude gyro that gave the degree of nose-up pitch. I had stopped the nose at 40-42° nose-up and decided to leave the aircraft in this attitude rather than change it the 3-5° necessary for an exact 45° indication. I notified my RSO of our nose attitude, then called coming out of burner at 25,000′ and began reading off airspeeds. I remember calling out 270 KIAS, then seeing the airspeed go through 260 towards 250. As I started to shift my scan away from the airspeed indicator and the standby attitude gyro to the AAI and begin my unusual attitude recovery, the aircraft entered a negative-G-condition to the extent that we were hanging in the straps. I do not recall making any deliberate violent forward stick movement. We came back in our seats shortly thereafter and almost immediately the left wing dropped off and we entered a spin. The remaining sequence of events I shall relate to the best of my knowledge, but it must be fully understood by the reader that due to the nature of the spin there may be some inaccuracies in my description of the spin and my efforts to recover.

"As soon as I entered the spin I notified my RSO that we were spinning. I am reasonably certain I neutralized the controls with some forward stick. After approximately two turns I called out deploying the drag chute (I was so sure that this would recover the aircraft that I can remember thinking how foolish I would look coming home without a chute). As soon as I entered the spin I began trying to recall the exact spin recovery procedures as dictated by NATOPS and trying to determine the direction of the spin, which I believed to be to the left. I had difficulty trying to find the needle-ball, and if I did see it, it didn't register in my mind. Shortly after deploying the chute I attempted using the spin recovery technique of full back stick, opposite rudder, and pro aileron. The spin was oscillatory in nature in that it would go from a gentle arcing into what seemed similar to a violent snap-roll. The AAI was 30 units and we were in a positive-G-condition throughout most of the spin. Each time it would slow up I remember thinking that the spin was recovering and would attempt to fly out of it by neutralizing the controls with some back stick, but just as suddenly as it would seem to be recovering, it would snap back into the spin. Somewhere in this portion of the spin I remembered a discussion of a tiger talk article



which said something to the effect that by grabbing the temp control with your right hand and the drag chute handle with your left hand you'd decrease your chances of screwing things up. Even though this would more than likely refer to post-stall gyration recovery techniques than it would to a fully developed spin condition, at this point I was ready to try any thing, so I let go of the controls. I believe that the next time the spin slowed down I resumed the controls again, thinking that the spin was on the point of recovering.

"Somewhere along the line I recalled from a spin lecture by a qualified squadron instructor pilot, the NATOPS Officer, that once out of afterburner, throttle position had no effect on the spin but I tried moving the throttles to idle anyway, eventually repositioning them back towards full military. I do not recall the IAS at any time during the spin. I cannot relate any of the sequence of events with any specific altitudes, but I do know that I was referring to the altimeter during the course of the spin with the idea in mind that, as briefed, 15,000′ would be our ejection altitude, since it was supposed to take 5000′ to recover and 10,000′ to pull out of a fully developed spin. I notified the RSO at some time of the possibility of ejection. Because we had ICS and I still had flight controls I assume that the engines were running and we had electrical power and hydraulics, even though I had neglected to drop the RAT. During the later portion of the spin I was becoming more and more confused and was uncertain as to whether or not we were even spinning in the same direction as we had started. When I saw 15,000′ on the altimeter I said something to the effect 'Eject, no, wait a minute!' The reason for the latter part of the transmission was my belief that once again we were beginning to recover, but when the aircraft snapped off again I called out 'Eject, Eject' going through 12,000′. When I heard the RSO eject I let go of the controls and reached for the face curtain. My hands seemed to float towards the face curtain, indicating that the aircraft may have been in a slightly negative-G-condition,—possibly from my sudden release of the controls . . ."

The Radar Systems Operator had this to say about the experience as the *Phantom II* snapped into the spin:

". . . The next thing I was hanging in the seat. My flight pubs and my helmet bag crashed to the top of the cockpit. Then the port wing went down. We came right side up and then we were on our back again and then we were spinning and seemed to be in uncontrolled flight. A couple of times we seemed to be coming out of it and then we were right back in. I seem to remember the pilot saying we were at 21,000 and could get her out, and then he said we were going to have to get out. He hollered, 'Eject, Eject.' I reached for the face curtain. Just then he said, 'Hold it,' and something else. Then again he said 'Eject.' and I went . . ."

Both men made it unharmed and the pilot had a subsequent message: ". . . I believe this accident could have been prevented if I had had a more thorough understanding of the flight characteristics of the RF-4B. This could have been accomplished by more study of the NATOPS manual and by more discussions with other pilots. Future accidents of this nature can be avoided if pilots will not allow themselves to get careless and ignore the inherent dangers of flying high performance aircraft. It should be clear in each pilot's mind that every time he walks out to his aircraft he must be mentally prepared for the unexpected. Had this been true in my case, I believe this accident would never have occurred . . ."

Between the pilot and the RSO, the facts concerning this accident seem to be pretty complete and conclusive. The board made this brief conclusion. ". . . The cause was pilot factor in that he failed to control the aircraft properly resulting in a spin. He then failed to execute proper spin recovery technique. His instrument scan and awareness of what his airplane was doing was also a serious deficiency . . ." The board further stated that, ". . . NATOPS was not a factor . . ."

Between this spin article and "Spinning And Winning" in APPROACH, December 1966, pilots should have a new insight into the stall-spin problem. ◄

FIRE FLIGHT

Pulling up in a hard climbing turn after rolling in on a railroad siding, an A-4E pilot heard and felt a loud bump which bounced the aircraft up and down. Seconds later the fire warning light came ON and the controls started to get stiff. The pilot reported on the radio that he'd been hit and was heading toward the coast.

"I don't know how many miles it was to the coast but it seemed like it took years," he recalls. "Things started to get progressively worse—I was losing this and losing that. The controls started to stiffen. It took quite a bit of right aileron to keep the wings up. I was still at 100 percent and climbing, still doing 350 kts. I was starting to get wisps of smoke in the cockpit. I began shutting off my electrical equipment—as much as I could remember. I was kind of busy watching what was going on and I might have missed some of it. Then I thought I would try to get the radio back on so I put the emergency generator out; it worked all right. I just kept heading toward the coast.

"About this time I started to get some engine explosions, quite a few of them, 10 or more in rapid succession. I thought the engine was going to blow up, but I still wasn't going to get out of it. I thought 'if I can just stick it out to the coast . . .' and then the coast went under my nose.

"At this point the engine flamed out and the RPM started unwinding all the way down to zero. There was complete silence; I could hear a crackling which sounded like fire and I was still getting explosions.

"About this time the smoke started getting pretty heavy in the cockpit. I cinched my mask up real tight and then the smoke got so thick I couldn't see out. I couldn't even see the instrument panel—it was like somebody had painted brown paint on my visor. I didn't smell the smoke because I had my oxygen mask on. I reached for the ram air switch but I thought the ram air would hardly help this so I reached for the canopy ring and pulled that off and then it really hit the fan—the heat and flames. I just had to get out of it; I couldn't stand it.

"I don't know why I decided I had to get the face curtain instead of the alternate handle. I think if I had gotten the alternate handle I would have burned my hands. *(There is no mention of gloves.—Ed.)* The wind got under my helmet visor and forced my head back; my mask was floating up my face. The wind must have sucked the flames through the vents. I reached up for the face curtain and got my hands in the slipstream; that's how my shoulder was dislocated. I got my hands back in and tried again—kind of crept them up along my face. I couldn't see anything; the smoke was too thick.

"The plane felt like it was rolling and falling off on the right wing. I knew I was going very fast but all I could think about was getting out of the airplane. I had it so fixed in my mind that I had to get the face curtain that I didn't even think of the alternate handle. As I said before, now that I look back I am glad I didn't think of the alternate handle because I believe I would have burned my hands.

"Finally I got hold of the face curtain and then pulled. Before I punched out, I pulled the lanyard on my survival radio on the front of my vest. I was aware of the seat going out but the opening shock of the parachute just seemed like a little tug.

"I looked over to my right and saw my wingman circling level with me. Below me I could see boats all over the place. I looked up and four or five gores were gone from my parachute. Then I looked down at my feet and that was a great shock. My right boot and sock were gone completely although my left boot was still there. I had zippers in the sides of my boots. The zipper in the left boot was a strong zipper but the zipper in the right boot was one a cobbler had put in and it probably couldn't stand the strain.

"I couldn't see either of the leggings from my anti-G suit, just a couple of burnt tatters, and the legs were gone from my suit. I could see that my legs were burned pretty badly.

"I tore my oxygen mask off. My watch was gone, my arm was burned and everything was twisted around in a state of disarray. I kept trying to remember which seat pan fitting I was supposed to release and finally I remembered, 'left for release and right for retain.' I let the left side go and I found the lanyard and hooked it onto the torso harness buckle. I started looking around trying to

figure out how to get the raft out. I couldn't make head or tail out of the thing; it was just a big mess of cloth and foam rubber. I could see where the lanyard went into the seat and I jerked on it but I couldn't get it out.

"My examination was very cursory. My state of mind was such that I didn't spend a lot of time on it. I thought about pulling the Mk-3C toggles but I saw all those boats down there and thought I might have to do some swimming so I didn't inflate it. I looked down and I had lost one radio, the one on the outside of my survival vest. I took the radio off my torso chest strap and I said something to my wingman—I don't remember what. About this time I hit the water.

"I reached up and released the left shoulder Koch fitting and it snapped right out. Then on the right shoulder fitting I reached up and lifted the safety latch but for some reason I forgot to pull down on the bottom of the buckle and it wouldn't open. Finally it dawned on me and I pulled down on it and it released.

"The swells looked like they were 3 or 4′. My hard hat felt very heavy on me and although I remembered they said hang on to it so when you go into the helicopter you don't hit your head, I said to myself, 'I'll sweat the contusions later; I've just got to get this thing off.' About 15 minutes later I saw it was still afloat.

"I didn't have any trouble with the shroud lines; the parachute was floating next to me. I was treading water and trying to stay as low in the water as I could so the junks wouldn't see me. The seat pack had a little bit of buoyancy; I held on to that for a little while. At this point I got rid of my left boot.

"I kept trying to figure out how to get the raft out. It was just a big wad of stuff. I suppose if I had been able to sit down and fiddle with it, I would have been able to get it out but I was treading water and ingesting a lot of water. Occasionally I would sink beneath the surface and I couldn't concentrate long enough to work on the raft. I'm sure I could have gotten it eventually, though. I think if I had inflated my Mk-3C I could have spent the time dragging the raft out of the pack, but, as I said, I was afraid of the boats and thought at the time that I could get along without it.

"About this time the seat pack started to lose its buoyancy. It was holding about 2 or 3′ under water and then it started to settle further. I would take a good gulp of air and open my eyes underwater. I could see what my hands were doing but I really couldn't see what was going on. I kept doing this and made a last effort to get the raft out this time—get it out or get rid of it. I held my breath and started working on it. When I stuck my head up to breathe I could see the surface shimmering above me. I kicked back to the surface and got a breath of fresh air. Then I took my knife out and cut the raft away. I was treading water but I was having trouble keeping my head up above water.

"I saw my wingman fire his rockets. A *Spad* made a couple of strafing runs. By now I was really starting to hurt. I needed something to hold me up or I was going to drown. I decided to inflate the Mk-3C in spite of the boats. I reached down to pull the toggles and *there weren't any toggles.* I guess they had been burned off. I couldn't get the thing to inflate. I was starting to get worried; by now I was taking a couple of gulps of water every few seconds.

"I tore the flap off the Mk-3C and pulled the pin out to fire the cartridge. I found the end that had the trigger on it. At first I couldn't get it to go but then I popped it and it floated me right up to the surface. Prior to this I had dumped my survival vest trying to get as light as I could. I was sorry that I had done this because if I had blown the Mk-3C before this I could have saved the survival vest. I was so concerned about remaining free that I was going to do everything to stay out of sight.

"I called the *Spad* and asked him about the helo. He called me back and asked me about smoke flares so I dug one out and lit it off. I saw the helo coming. I told him that he was abeam of me at 9 o'clock and he turned toward me. I told him I was at his 12 o'clock. He was dumping fuel because he was too heavy to pick me up. He got over me and dropped the sling into the water and I swam over to it. I got in and just closed my eyes and held on for dear life. I felt them raising me up and I felt some hands on me and then I was back in the water.

"Apparently the helo had gotten into some kind of power stall because of its weight and the temperature. He settled into the water. Just that little rest on the water was enough for him to build his rpm back up. He bounced back into the air and headed for the tin can. While I was in the helo they cut away a lot of the straps that were really starting to irritate my legs. A doctor was waiting on the fantail when the helo landed."

The squadron commanding officer notes that since deployment the squadron had had two thorough briefings on the procedures for inflating the raft. Therefore the pilot's difficulty was believed due to his dislocated shoulder, the fact that he was treading water and nearly exhausted, and the damage to the seat pack during the high speed ejection.

FORUM:

Do you have a question regarding materials or procedures now in use in Naval Aviation? For an answer send it to FORUM, U.S. Naval Aviation Safety Center, NAS Norfolk, Va. 23511.

Transferring Solvents—Missed Main Point

Boston, Mass.—We subscribe to your magazine and enjoy reviewing material in connection with aviation fire safety activities. We take this opportunity to comment briefly on "Stoddard Solvent Is Flammable," page 41 of the December 1967 issue.

You quote NavSo P-2455 and try to highlight some of the pertinent precautions that should be taken as a result of the fire that occurred. We feel that you missed the main point—namely, that transferring a solvent by means of air pressure is prohibited.

Enclosed is a copy of the National Fire Protection Association's pamphlet "Flammable and Combustible Liquids Code," (NFPA No. 30) and we refer you to paragraph 5144 which we feel is pertinent to this subject. We hope you will find this comment of interest and value.

C. H. TRYON
DIRECTOR OF TECHNICAL SERVICES
NATIONAL FIRE PROTECTION ASSOCIATION

▶ Your comments are appreciated and the information is quoted for the benefit of all concerned:

"Flammable or combustible liquids shall be drawn from or transferred into vessels or containers within a building only through a closed piping system, from safety cans, by means of a device drawing through the top of a container, or from a container by gravity through an approved self-closing valve. Transferring by means of air pressure on the container shall be prohibited."

The foregoing precaution is solid. However, your letter led to the discovery that in the re-issuance of OpNav 34P1, "Navy Safety Precautions" as NavSo P-2455, this item was inadvertently omitted. The cognizant authorities will issue a correction in the next revision and state in the meantime that: "Compressed air will not be used to increase flow of liquids from containers. This practice is particularly dangerous and is strictly forbidden."

Ordnance Manuals Being Revised

Directives, manuals, revisions to publications and other printed material concerning ordnance, armament and weapons systems are being issued by various command agencies.

This has resulted in nonstandard binding methods from agency to agency, preventing consolidation of instructions into a single binder for a specific weapons system, equipment and stores. This is not only costly but serious errors could be made. It also presents a frustrating situation for the deployment of squadrons.

Hope you can get the gears grinding to relieve this situation.

AOC JOHN A. RITCH
NAVAL EXAMINING CENTER
GREAT LAKES

▶ Good news concerning this matter comes with NavAir Notice 5600 of 28 August 1967 which establishes the management responsibility for technical manuals for airborne ordnance and related items. The Notice lists those OPs (Ordnance Pamphlets), ODs (Ordnance Data), and OSOIPBs (Ordnance Supply Officer Illustrated Parts Breakdowns) which have been transferred from NavOrdSysCom to NavAirSysCom as of 1 July 1967. These manuals will be identified by a newly assigned NavAir number with the former OP/OD/OSOIPB number in parenthesis.

As of this writing a NavAirSysCom AdHoc committee is working out details of the Airborne Weapon Armament Technical Manual Program. We believe that the problems you mentioned will be corrected as a result of these programs since the following specific items have high priority:

a. Specifications are being written to standardize manuals.
b. Centralized Control is being established for changes for technical manuals.
c. Related to a. and b. is the provision that a formal rapid action printed change will be distributed within days after the change is approved.

Life Vest

The extension of the Mk-3C life preserver which wraps around the pilot's back causes pain and discomfort. The high wrap-around feature is immobilizing and prevents the pilot from retrieving dropped objects from the floorboards in A-4F aircraft without releasing his harness.

I recommend a new underarm type of life preserver, similar to the Air Force's LPU 2/P or LPU 3/P, which will be lighter and provide more maneuverability in the cockpit.

LTJG R. J. SELMAN, JR.
VA-93

▶ The LPA-1, Life Preserver Aircrewman, known during its development as the Mk-6, should go a long way toward solving your problems. The LPA-1 and the LPP-1, Life Preserver Passenger, are replacing the Mk-2 and Mk-3C. As of this writing, 7600 LPA-1s were on order, delivery to start in March, and 17,588 LPP-1s were on order with delivery to begin in May. ◀

MAN MADE TURBULENCE

An *Orion* on a local NATOPS check was making a practice, no-flap landing to the right runway of a dual system. Another P-3A was awaiting takeoff and was positioned between the parallel runways and perpendicular to them.

It is standard practice to have the power levers ahead of the start position while waiting for takeoff clearance in the *Orion*. This is done to keep positive thrust on the aircraft so that there will be airflow over the oil coolers. At this position the engines and propellers are both producing positive thrust thereby disturbing the air for a considerable distance in back of the aircraft. As the landing P-3 passed through this propwash, it experienced a violent left wing pitchdown moment and came very close to striking the pavement with the left wing tip.

Substitute in this situation a smaller tactical aircraft such as the A-4 or F-8, both of which operate from this field, and you'll very likely have an accident. I point this out hoping to acquaint interested parties with this unusual situation so they can be forewarned.

Editor's comment: Such turbulence around airports is a frequent and varying problem. Each potential situation requires preplanning and rapid on-the-spot assessment. See the April 1966 issue of APPROACH *for a comprehensive article on this subject entitled "Wake Turbulence."*

RAWS to the Rescue

The flight was a scheduled ASW training hop. As plane commander, with 1700 hours in the S-2E, I was to train the crew and tacco in ASW tactics. We were running our ASW problem and the FRP (new tacco) was having trouble in arriving at the solution. I checked to see that the trusty autopilot was engaged, and as advertised it had the *Tracker* at 350′ in a slight port turn. I then proceeded to help the tacco.

I suppose it was 2-3 minutes later when I heard the Radio Altimeter Warning System horn come ON. At first it didn't really bother me because it had been intermittently beeping at or around 300′. My first thought was to move the aircraft to 400′ to turn

ANYMOUSE

The purpose of an Anymouse (anonymous) Report is to help detect or prevent a potentially dangerous situation. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experience. As the name indicates these reports need not be signed. Self-mailing Anymouse forms are available in readyrooms and line shacks or through your ASO. All reports are reviewed for appropriate action.

the horn off. As I looked up at the altimeter, I discovered it was not the 300′ warning as before but the 100′ beeper. I immediately rolled wings level and stopped the rate of descent *as the aircraft was passing through 30′*.

At the time I rolled wings level the autopilot was engaged, altimeter control was also engaged and the aircraft had commenced a descent.

This incident (near accident) points out that even though the S-2E autopilot is one of the best and most reliable of the fleet, individuals should not become complacent and forget to monitor their gages. Also score one for the RAWS, I will never again bad mouth it.

Mixed Landing Approaches

Flying an F-8, I requested a morest and was cleared by the tower for an approach to 32. The duty runway was 04 while the morest was set up on 32. On final, I was waved off due to a fouled deck and was re-cleared for a left-hand approach back to 32 for another try. Meanwhile an F-4 was cleared into the pattern for 04. On final, the F-4 was waved off, presumably to give me priority. He then requested a morest out of a right downwind. The tower operator evidently felt he could not grant the request in the interest of safety so he directed the *Phantom* to make a right-hand turn back into 04.

In trying to create safe traffic separation between us, the tower neglected to realize that our *approved* approach patterns had set the stage for a possible midair south of the runway intersections. I had to dive under the F-4 to avoid a collision. The safety lesson as I see or saw it (first hand), is that everyone must fly *heads up* on multiple landing approvals and not depend totally on the tower for safe separations.

Another Near-Midair

A flight of 3 A-4Bs was cleared to make individual departures via a published SID to "on top" which was reported to be 3000′. The local weather was 300′ overcast with 3 miles visibility.

Each aircraft in the flight read back ". . . maintain 2000 until 7 NM southeast" except No. 2 who read back ". . . 7 miles east." Ground Control did not correct the readback. The No. 2 aircraft took off, called clear on top, canceling instruments. Departure control requested the pilot's altitude. "Passing 4500," was the reply. He was approximately 8 NM east. The situation was that another aircraft was assigned 3000′ inbound. The controller, thus, had no cause for alarm when the two blips merged on his scope . . . until the aircraft at 2000′ called "on top." Neither pilot saw each other in passing as it was truly heavy clag. How close they came will never be known. The ASO requested that RATCC include the fix, (7 NM on the 140-degree Radial), in the clearance as published on the SID and that Ground Control personnel more carefully monitor the readbacks.

A Dangerous Hydraulic Leak

On a normal A-4E preflight a small amount of hydraulic fluid was evident on the barrel of the main landing gear. The fluid was wiped off and no evidence of leakage was noted. Hydraulic fluid spurted out the air pressure fitting when the troubleshooter attempted to determine if the strut was properly inflated. Having had previous experience with malfunctioning struts in the F-9 model aircraft, the troubleshooter downed the aircraft and had it moved into the hangar for further maintenance.

While the *Skyhawk* was being jacked up, hydraulic fluid poured out from around the piston when the strut was about half extended. Inspection revealed that; the O-ring which acts as a seal for the fluid was completely deteriorated, the barrel and outer cylinder were badly scored and the required felt wipers were not even installed.

Had the aircraft taken off in this condition, the fluid would have poured out during liftoff when the strut extended. This surely would have covered the tire and brake assembly with flammable fluid. On landing, the strut would have been unable to absorb any of the landing shock and would have transmitted force to the wing spar—possibly enough to break it. The brakes would have been extremely weak with a possible fire hazard.

Some ASW Helo Peculiarities

On a night ASW training mission in an SH-3D, an experienced HAC and a new HA2P were teamed together for the first time.

The flight departed as scheduled for its assigned low level instrument area 20 miles seaward. The copilot, in the right seat, set up for a low visibility SAR approach after completing a series of automatic and alternate approaches to a sonar cable hover. The crewman dropped a smoke light from the afterstation to simulate the survivor. The approach was conducted using standard NATOPS procedures for an alternate approach.

As the aircraft neared a hover, the HAC waited for the HA2P to

call for his cyclic coupler to be switched to doppler. The HAC was waiting to see how long it would take the HA2P to call for it as on two successive approaches he had forgotten it altogether.

The aircraft was in a fairly level attitude at 45′ as the HA2P waited for the aircraft to center itself. Without cyclic doppler on, the aircraft began to drift to the left at 12 kts, 6 degrees nose down. The HAC switched to cyclic coupler without call as he noticed the ball ¾ out to the left. The HAC told the HA2P to center his ball and relevel the wings as the left drift continued to 15 kts and the nose dropped further to 10 degrees down. Mistakenly the 2P added right rudder, further aggravating the situation. The HAC grabbed the controls, pulled full UP collective and leveled the wings as the radar altimeter started to fall below 35′. There was no visible horizon, but the rotor wash kicked up so much spray that everything around the helo was masked by a white wall of water. (The crewman estimated that the aircraft came within 5′ of the water.)

As the helo started to climb it began to spin to the right. By this time the HAC, who had his feet on the floor, got both feet on the pedals and applied full left rudder. The helo continued a slow right spiral. Torque was 105 to 115% for about 3 seconds. The aircraft climbed to 550′ at 0 airspeed. With the wings level and plenty of altitude the HAC sensed the right spiral and immediately realized what was happening. He reduced collective and eased into forward flight.

The rest of the flight was uneventful. Of significance is that two days previously a Sikorsky factory test pilot had lectured a squadron APM about tail rotor buzz and loss of tail rotor authority. He had specifically mentioned an incident that occurred in another squadron in which a pilot had encountered a similar situation in a night ASW hover. The HAC in the incident recounted above remembered this when it happened to him. He realized that he had run out of tail rotor authority because of the extremely high torque being pulled. He effectively recovered control by reducing collective pitch.

This is a problem which appears to be inherent in the SH-3D because of the greatly increased power available from the T-58-10 engine. This particular HAC, with 1300 SH-3A hours, had never before experienced a loss of tail rotor authority to the point where he could not hold aircraft heading. The consensus of the squadron pilots is that this particular situation is virtually nonexistent through the normal range of operations with the SH-3A. But in the SH-3D several had experienced loss of tail rotor authority to the extent that they could not hold high altitude, high gross weight, low wind hovers. They simply ran out of tail rotor authority before they ran out of power.

Apparently the design of the SH-3D is such that the total power available has been greatly increased, but there has been no corresponding increase in tail rotor authority. When such authority is exceeded, a simple reduction of collective pitch, if possible, will allow the pilot to regain tail rotor control sufficiently. Forward flight will also help to alleviate the problem.

Editor's Note: This Anymouse seems to prove that the system can work well. Similar past experiences thoroughly disseminated are a big stick in the mishap prevention program. A torque-spin can happen in the SH-3A also, but it is not as easy to enter. It is easier said than done to say, "Don't allow a situation to deteriorate so far that you can't salvage the operation." The demands of controlling the H-3 under night IFR conditions at 40-150′ above the water indicate a need for getting thorough exposure very deliberately—hopefully during daylight, in preparation for night operations.

Observant Plane Captain

Two experienced pilots completed the pre-takeoff checklist in a C-47 and called for takeoff. They were located in the warmup area adjacent to the duty runway at a U. S. Naval Air Station joint-use facility which was located on foreign territory. A local controller (foreign) cleared the aircraft "to the duty runway and hold" which the pilot acknowledged. Both the pilot and copilot interpreted the transmission to mean *hold in place on the runway.*

As the pilot taxied across the runway warning line, the alert Plane Captain observed a commercial airliner on extremely short final and he called for an immediate stop. Because of the angle, the copilot did not have an opportunity to visually check the approach area. The pilot, who was highly experienced and normally cautious and deliberate in his habits, failed to visually clear the area prior to taxi. Whether he would have observed the approaching aircraft in time to prevent a serious accident and the loss of many lives is pure conjecture.

Two cardinal points here are worthy of emphasis. (1) Insure positive mutual understanding of each tower transmission especially when a foreign controller is on duty and language is a factor. (2) All plane captains and other crewmembers must continue to be observant *both on the ground and in the air.*

Hand Signal Dangers

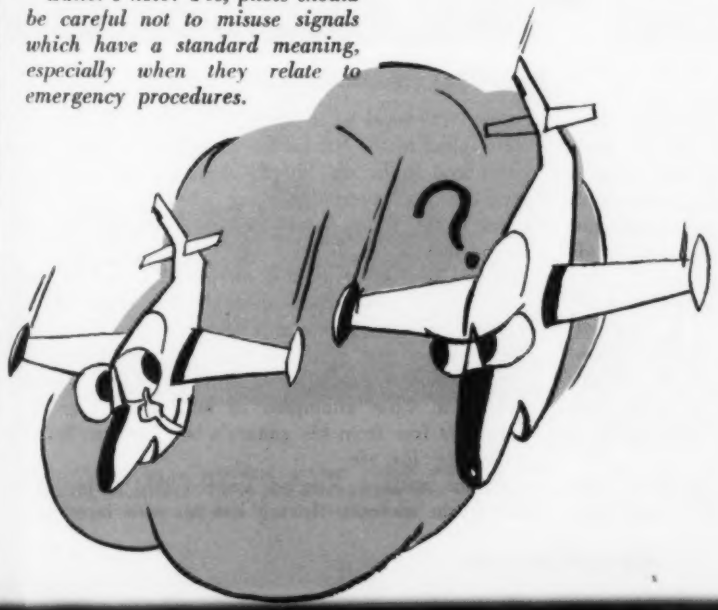
Recently, I went along for the ride in the rear seat of a T-2A. It was scheduled for a combat tactics mission with another *Buckeye*. After takeoff, the aircraft separated and a short time later, regrouped for combat maneuvers.

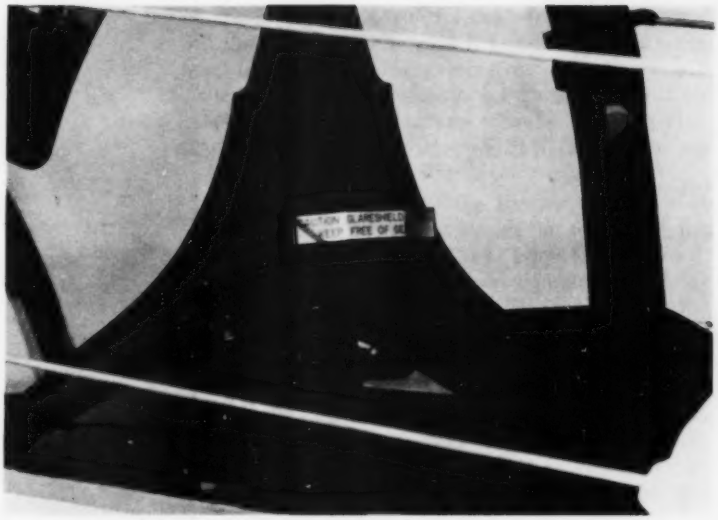
After finishing, the other pilot made the hand signal to *eject* to my pilot. Instantly, this alarmed me and I actually braced myself for the jolt because I knew the pilot had controls for dual ejection. I called the pilot and asked if there was anything wrong. The fact that he did not immediately answer me added to my nervousness and started personal thoughts toward initiating my own ejection mechanism. Fortunately, in about ten seconds, the pilot answered with a short "No."

I later learned that the other pilot only meant "I got you." It was his way of saying he had won the dogfight.

I was not briefed in regard to the altered meaning of the standard "eject" signal. I wish to point out the dangers of such a confusing gesture.

Editor's note: Yes, pilots should be careful not to misuse signals which have a standard meaning, especially when they relate to emergency procedures.





Glareshields should be left uncluttered.

Troublesome Kneeboard

At the completion of a round robin the TA-4F pulled into the chocks. While the gear pins were being installed prior to shutdown, the rear seat pilot removed his kneeboard and placed it up on the right hand side of the glare shield. In the TA-4F, this shield is an integral part of the one piece canopy that covers both cockpits. A moment later the front seat pilot raised the canopy without uttering a warning over the ICS.

The movement caused the kneeboard to fall back into the cockpit and hit the rear seat pilot on the head (luckily his hard hat was still on). Then it bounced over the starboard side of the *Skyhawk*. The engine was still idling and the elusive board was sucked into the air intake and ingested by the engine.

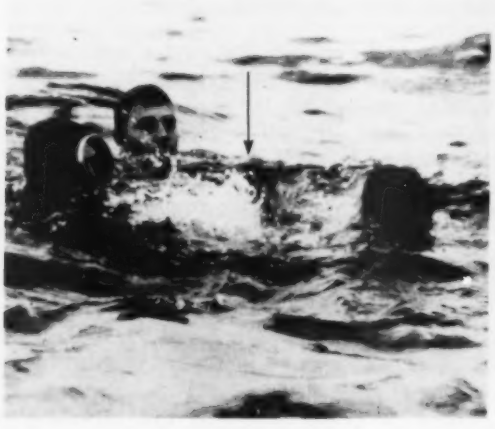
Result—one possible engine change.

Conclusion—always use the ICS to warn of actuations such as this and find a better place to temporarily rest the kneeboard. Moreover, pilots must keep in mind the location of the two intakes on both sides of the cockpits and that anything dropped over the side can be sucked into the engine while it is running on the deck.

Ed. Note: The Commanding Officer of Air Development Squadron Five has also informed NavAirSafeCen of this potential FOD hazard. His corrective action is a warning decal as depicted in the photograph. ◀

A camera catches the restoration of the

BREATH of Life



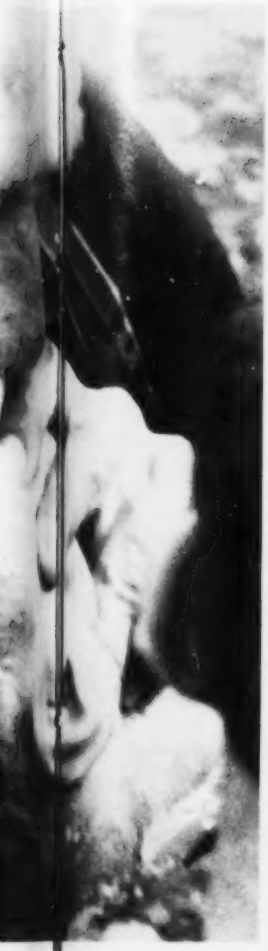
Few events in all human experience approach the drama of the restoration of life to a person who is clinically dead. The following episode, reconstructed from the statements of participants and witnesses and documented by photographs made on the scene, may very well be unique in the annals of naval aviation rescue and survival.

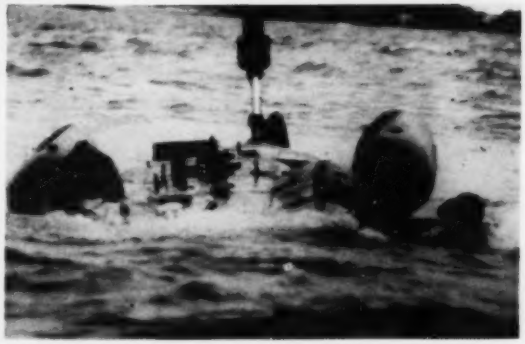
The place is Subic Bay . . . the occasion, a daytime simulated combat rescue pickup of a "downed pilot" in the water by Paramedic Rescue Team ONE. We will begin our narrative as the crashboat drops the "pilot" and a safety swimmer and the rescue helicopter with a crew of four and a photographer arrives . . .

During flare recovery after initial overshoot, the helicopter lost RPM, turned right and struck the water. Near level when it hit in a left skid, the aircraft rolled to the left as the rotor blades struck the water and broke up. Shortly thereafter it rolled on over into the inverted position where it floated for about five minutes before sinking completely below the surface.

While the helo was still on its left side, the copilot and pilot escaped through the right pilot's window. The two rescue crewmen aboard, ADJ3 Bill E. Luse and HM3 Richard L. Kuschel, exited through the starboard side cabin window. During their exit, Luse attempted to help PH2 Tom W. Geren get free from his gunner's belt but was forced to surface for air.

At the surface, Kuschel learned that Geren was still in the aircraft. Having lost his own face mask





What began as a simulated combat pickup ended in the dramatic resuscitation (left) of a photographer who was aboard the demonstration rescue helo which crashed and sank (above).

in his escape, he obtained a mask from HM2 Eugene W. Bliss, the safety swimmer. (Bliss had dived when the helicopter started coming down on him and subsequently dived twice to check on Geren.) Kuschel donned the mask, "hyperventilated a little bit," then dove back into the window of the helo to see what had happened to the photographer.

When Kuschel reached the window, he saw that Geren was still struggling weakly to get out of the window but his gunner's belt was still fastened. Kuschel could not get past Geren in the window so he enlarged the opening of the window by using the edge of his hand to break more plexiglass.

He then had to surface. Kuschel dove a second time but because of Geren's position was unable to reach the holding strap to the gunner's belt. He could not release the buckle because it was locked. Again he ran out of air and had to return to the surface. He quickly dove a third time, swam into the helo, cut the gunner's belt and pulled Geren out the window. As Kuschel was swimming upward with Geren, Bliss dove down and helped pull Geren to the surface.

Shortly after the crash, LT Frederick H. Buehl, MC, officer in charge of Para-Medic Rescue Team ONE, had entered the water from the crash boat With the aid of Bliss, Dr. Buehl began mouth to mouth resuscitation and external heart massage in the water. At this time Geren was clinically dead; he was without heartbeat or breath and was cyanotic. Kuschel assisted Dr. Buehl and Bliss onto the rapidly sinking aircraft where, standing waist deep, they continued their emergency care until the wreckage sank from under them. AE3 Keith D. Farren, who had been the "downed pilot" tangled in his parachute, assisted in holding Geren's head and shoulders above water during the emergency measures.

At this time, Geren groaned and began to breathe. The rescuemen then started Geren for the crash boat.

Luse, Kuschel and FN J. K. Arnold, a crash boat crewman, aided in getting all survivors aboard. (Arnold had gone into the water immediately after the crash. He helped the pilots and crewmen to the crash boat and stood by in the water to assist when Geren was pulled into the boat.)

For another 20 minutes Geren did very poorly and additional emergency care was necessary. Mouth to mouth recuscitation was continued in the crash boat. Finally, he began to breathe again and regained consciousness. He was taken to the hospital where his recovery was rapid and uneventful.

To all those involved in the rescue and resuscitation of Geren, APPROACH extends a well done. ◄

HYPOXIA

The following report of hypoxia experienced by the pilot and pilot-passenger in a TF-9J points up the necessity for immediate descent to lower altitude whenever hypoxia is suspected. In this case they remained at altitude for approximately 15 minutes while symptomatic, checking their aircraft oxygen systems (finding them normal in all respects) and trying the bailout bottles.

The two pilots briefed for an early AM takeoff for a cross-country. Preflight was normal and both noted that the bailout bottles attached to their respective ejection seats registered in the FULL range.

The flight proceeded at FL 350 as cleared and cabin altitude was maintained at 23,000′ in accordance with the normal pressurization schedule of the aircraft. At about 1.0 hours the passenger-pilot in the rear seat flew the aircraft briefly. At this time his flying was a bit rough but he attributed this to his recent absence from flying (he had just returned from Vietnam and leave) and to his relative unfamiliarity with the TF-9J. He noted some tiredness and heaviness of his limbs but this did not alarm him.

The pilot took control back and kept it until about 1.5 hours when he had to make some computations involving the simultaneous use of a kneeboard, pencil and flashlight. While making the computations with his head down, he felt mildly nauseated and faint for the first time. The aircraft started a descent at 1000 fpm and at this point the rear seat pilot-passenger took control. The pilot then checked his LOX gage, regulator, blinker, mask and connections. All was in order and he was on 100% oxygen. He cinched up his mask tightly, selected safety pressure on the regulator and consciously attempted to control his breathing for about 30 seconds. None of these actions improved his symptoms and he realized that he might well be hypoxic and/or suffering from contaminated oxygen although he noted no odors. He questioned the pilot-passenger as to how he was feeling. He was not feeling well and was flying very poorly—not maintaining altitude within 1000′ and allowing ascent and descent rates of 2000 to 3000′ to develop.

While this was going on, the pilot-passenger had nausea, mild faintness and mental and physical sluggishness. He noted a slow, idle scan, instrument fascination and slow responses to changes in aircraft altitude. He also had trouble holding his head up and keeping his eyes open. It is noteworthy that his obvious incapacitation did not alarm him. He, in fact, had a feeling that all was in order and rationalized his ragged flying by lack of recent experience in this aircraft.

At this point the pilot became alarmed, suspecting that they both were being affected by some fault in the oxygen system, and regained control of the aircraft. He instructed the pilot-passenger to turn his oxygen regulator OFF and go to the bailout bottle; he did the same.

The pilot noted a musty odor and full flow of oxygen which lasted an estimated 60 to 90 seconds. His symptoms of weakness and faintness improved on the oxygen. Expiration of the bailout bottle was abrupt, transition from free inspiration to apparent exhaustion of the bottle occurring over the course of one or two breaths. When this happened, the pilot elected to descend to a lower altitude immediately. He removed his mask in order to breathe. (He had already turned off the oxygen system because he suspected contamination.) Instructing the pilot-passenger to keep talking over the intercom, he pulled power to 80%, extended speed brakes and started down.

The pilot-passenger had experienced difficulty actuating the bailout bottle and had had to use both hands in order to pull the green apple hard enough.

EXPERIENCE

Once the bottle was actuated, oxygen flowed freely under noticeable pressure and with oxygen blowing out around the seal. His symptoms were improved but after 60 to 90 seconds, the bottle ran empty. He turned the aircraft oxygen back on in order to have something to breathe. During the subsequent descent, he experienced great difficulty holding his head up and keeping his eyes open but he talked to the pilot as requested and stowed loose gear preparatory to canopy opening.

The aircraft was leveled at 7 or 8000′ and slowed and the canopy was opened completely. There was a sudden blast of cold air and dust and both pilots felt better immediately. The pilot retained control and flew on for about 10 minutes until arrival at "X" AFB where he contacted the tower and requested cancellation of his IFR flight plan. He was given a frequency change and was told to contact "Y" Center. However, he reasonably refused to do so and requested again that the tower cancel his instrument plan and clear him to land. The tower did so and he made a "roger pass" landing at about 0800. By the time the two men were interviewed by a flight surgeon, they both felt completely well and were not examined. No blood tests were done for hypoxia or for carbon monoxide poisoning.

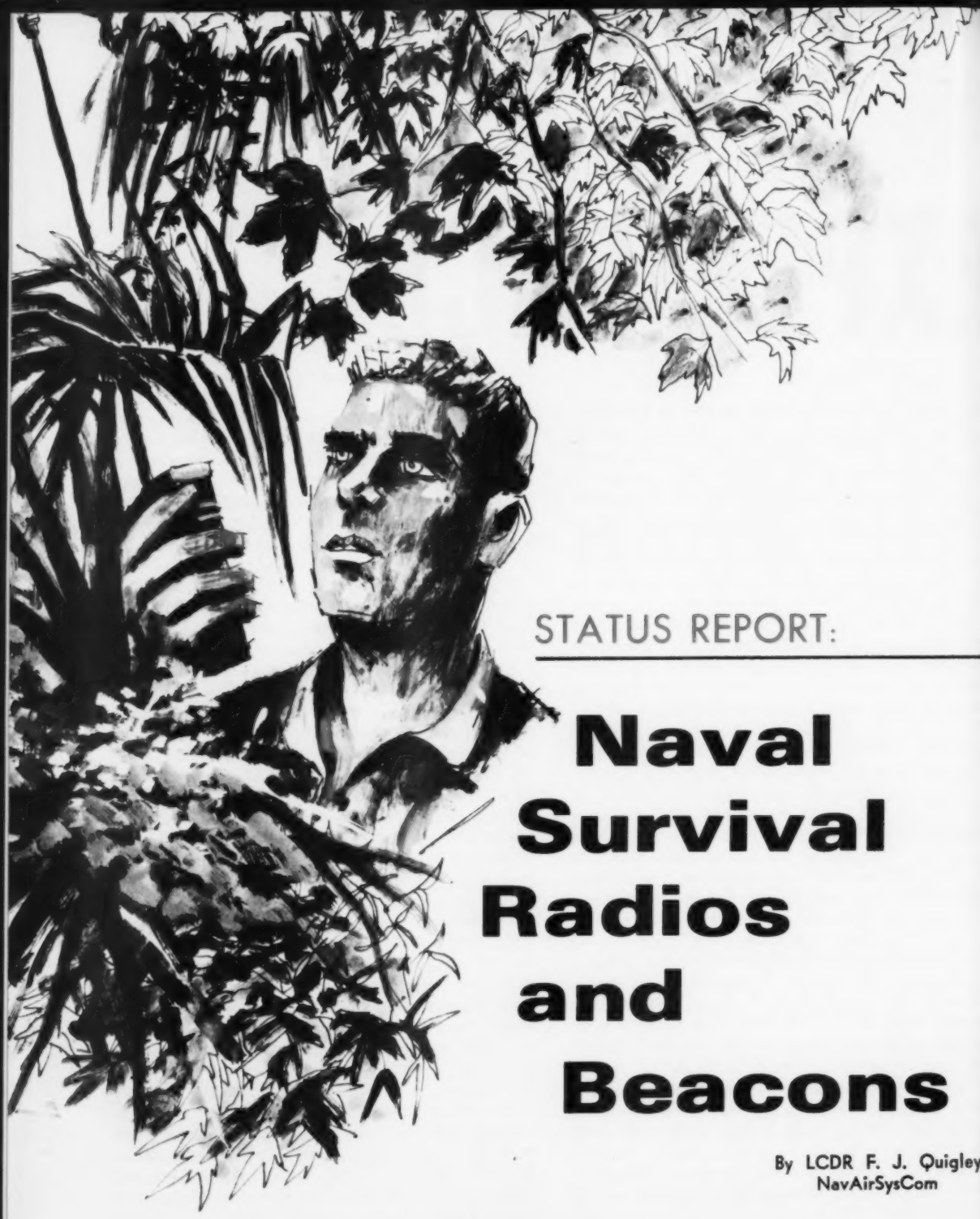
A LOX sample was taken for analysis and was found to be within technical requirements. A sample from the LOX cart from which the aircraft had been serviced that day showed no contamination and no contamination was found in the converter. Carbon monoxide tests on the ground, at 15,000′ and at FL 350 were negative. Inspection of the regulators and connecting hoses revealed no defects.

The investigating flight surgeon thought the probable cause of the pilot's hypoxia was a defective laminar seal resulting in his breathing ambient air at a cabin altitude of 23,000′ along with oxygen from his mask. Over a period of 1.5 hours, this could result in mild hypoxia. The flight surgeon thought the pilot-passenger's trouble was due to his poorly fitting mask. He was wearing a medium size when he should have worn a small. He was most likely breathing ambient air at a cabin altitude of 23,000′ mixed with oxygen from the aircraft supply over 1 to 1.5 hours. The investigating flight surgeon thought toxic contamination of the aircraft oxygen supply unlikely.

"The exact nature and cause of these pilots' symptoms must remain speculative since no material proof is available," the flight surgeon concludes. "It is most probable that they were hypoxic and that the hypoxia was due to defective masks."

"It is apparent from reading the *NATOPS Manual* and the *H-2 Bailout Bottle Manual* that a possible source of confusion exists with respect to the proper use of the H-2 bottle. From these sources it can be concluded that the bottle will allow the pilot to remain at altitude if necessity arises. It will not do so and apparently was never designed to do so. This has now been stressed to members of this squadron. Regardless of fuel state, location or other circumstances, if it becomes necessary to use the bailout bottle, *an immediate descent* must be made to altitudes where it is safe to breathe ambient air. The bailout bottle will not sustain an individual for 10 minutes at altitude. Both pilots in this mishap were under the impression that it would and probably most aviators in the fleet using this equipment are under a similar impression. This is incorrect and should be clearly stated in the *NATOPS Manual* which can be and is presently interpreted to mean the bottle is good for 10 minutes at altitude."

(Use of the bailout bottle is part of the oxygen chamber run which pilots and aircrewmen undergo every 36 months. Aviation physiologists in the chamber runs and flight surgeons in their squadrons should make sure that pilots and aircrewmen know what to expect from the bailout bottle—Ed.) ◄



STATUS REPORT:

Naval Survival Radios and Beacons

By LCDR F. J. Quigley
NavAirSysCom

At the outset we must define the words "survival radio" and "survival beacon." A survival radio, more aptly, should be called a personal survival radio. It provides two-way voice communications on one or more channels in addition to providing a beacon mode. This equipment is meant to be carried by each member of a flight crew as part of his personal survival gear. A survival beacon provides simply a swept tone beacon and is generally designed to interface with either the aircraft or personnel survival equipment so that it will automatically be activated upon egress from a stricken aircraft.

The following radios and beacons are the latest generation of equipment to be made available to the fleet. As soon as inventories become adequate (which will occur throughout CY 1968), technical directives will be prepared and issued to direct the replacement of specific older type radios/beacons with the newly acquired items.

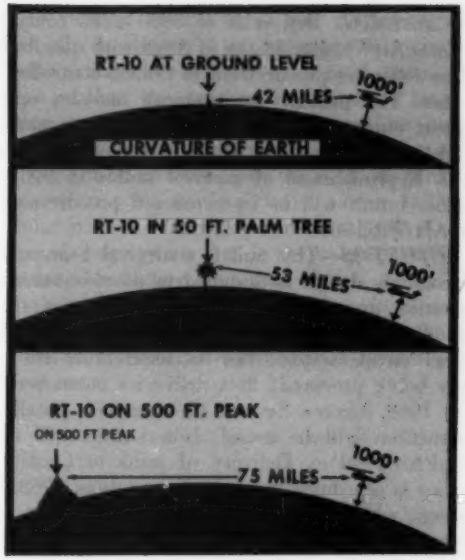
AN/PRC-49B/C—The AN/PRC-49B/C is basically a single channel survival radio; however, it has the capability of being installed in various arrangements as an automatically actuated beacon. At the end of CY 1968 this equipment will be replaced by one or more of the equipments discussed below.

AN/PRC-63—This unit is basically a single channel survival radio built so that its beacon mode could be actuated automatically. This feature, however, has proved impractical due to restrictions in radiation patterns, maintenance considerations and ineffectiveness of any practical installation. This unit is to be used, therefore, only as a personnel survival radio. Procurement and delivery of 12,000 AN/PRC-63s is now complete.

The AN/PRC-63 is a 1.1-lb radio constructed with microelectronic circuitry designed as a high reliability nonrepairable radio. A bent antenna does not necessarily constitute cause for rejection and judicious screening should be applied prior to such rejection.

RT-10—The RT-10 is a personal survival radio. The Navy procured 10,000 of these as an interim measure pending deliveries of the AN/PRC-63. The units are distributed solely to ComFAirWestPac.

RT-60—The NavAirSysCom has let a contract to convert all Navy RT-10 assets to two-channel RT-60 radios. The RT-60 will provide two UHF channels on 243.0MHZ and 282.2MHZ. Additionally, certain minor modifications will improve the watertight integrity and the antenna reliability of the equipment. The procurement also includes spare parts and maintenance publications. The modification commenced at NAS Atsugi in March 1968 and is scheduled for completion in late summer of 1968.



Showing "line of sight" transmission.

The RT-60 is intended to be used exclusively in Southeast Asia under the fleet control of ComFAirWestPac. At the completion of the modification program, ComFAirWestPac will assume rework cognizance in addition to the distributional control of the RT-60. This radio is again being used as an interim radio to fulfill the needs in Southeast Asia for a multichannel unit. Its size and age preclude considering the unit for more extensive future employment; upon completion of its role in the present conflict, it will receive no further support and will be considered a disposable, nonrepairable item.

It is to be stressed that at the present and for the next two to three years this unit is very much a part of the Navy's repairable survival radio inventory and that only upon depletion of the newly procured spare parts inventory will this unit become disposable. As the RT-60 is phased out, the AN/PRC-90 (see below) will replace it. There are a number of RT-10 training radios used by several training schools within ConUS. The conversion program also addresses these units. All training radios forwarded to ComFAirWestPac will be modified to have dual frequencies (245.0MHZ and 282.8MHZ) and will be returned to the sender.

AN/PRC-90—The AN/PRC-90 is a two channel personal survival radio and is the newest equipment to be procured by the Navy. It is a repairable unit weighing 1.4 lbs and employing microelectronic circuitry. It operates on frequencies of 243.0MHZ

and 282.8MHZ. Deliveries of 3000 units consigned to ComFAirWestPac began in April with distribution of the follow-on procurement to ConUS-controlled activities. The present procurement includes special support equipment, publications and spare parts to be delivered concurrent with deliveries of the unit itself. Replenishment of survival radios in the foreseeable future will be by continued procurement of the AN/PRC-90.

AN/URT-33—This unit is a survival beacon. This beacon-only device is designed to provide automatic operation upon egress from a stricken aircraft by providing for its installation in the aircraft's personnel escape system. Ten thousand units are presently being procured; fleet deliveries commenced in May 1968. Aircrew Systems Changes with installation instructions will be issued. Initial units will go to ComFAirWestPac. Delivery of units to ConUS activities is scheduled to commence in June 1968. The beacon, while providing automatic activation, may be switched to the manual mode at the discretion of the pilot. If recovered from the escape system, the unit may be used by the survivor as a backup beacon to his personal survival radio beacon. It is a repairable unit; therefore, maintenance manuals and other associated support equipments are being procured concurrently with the beacon.

(For a rundown on distribution of the above equipment, see Personal/Survival Equipment Crossfeed 4-68.—Ed.)

Special Support Equipment

AN/PRC-49—Some special support equipment is available for this unit; however, because this radio should be completely phased out in the next year, we will not discuss it here.

AN/PRC-63—150 units of special support equipment (AN/GRM-93) have been procured and were delivered in March 1968. This equipment is designed to be used by Intermediate Maintenance Activities. It essentially provides a go, no-go check of the various modes of the AN/PRC-63. The equipment will be delivered to all Force Commands having cognizance of the basic radio.

RT-10/RT-60—Special support equipment for this unit is presently available in the WestPac Area. Fifty test sets TS-2531/UR are available through ComFAirWestPac. Due to limited availability, this equipment is on intermediate maintenance test set. The equipment provides a go, no-go indication on the various operating modes of the RT-10/RT-60.

AN/PRC-90—The support equipment for this unit represents a departure from previous philosophies. The test equipment which is scheduled to be delivered with this radio will provide go, no-go testing capability at the organization maintenance level as well as the intermediate level.

The new AN/PRC-90 is a two channel personal survival radio.

The ultimate goal is to have each aircraft/pilot escape system outfitted with a survival beacon (AN/URT-33). Additionally, every crewman will have as part of his personal survival equipment, a personal survival radio (AN/PRC-90 or AN/PRC-63). This goal as yet cannot be completely met with the present inventory or procurements that are currently under contract. The interim goal, therefore, is to at least ensure that each pilot of a fighter/attack aircraft is equipped with a personal survival radio and/or beacon and that each patrol type aircraft and helicopter is equipped with sufficient personal survival radios so that it would be able to present an emergency signal to rescue craft. The distribution of assets within the fleet commands is to be at their discretion.

Miscellaneous Aspects

Batteries—All survival radios/beacons in use today employ mercury (mercuric oxide-zinc) batteries. This type of battery has the one distinct advantage of having the highest energy density of any primary battery source presently available; however, it has several severe limitations. This battery type is severely limited in performance by a cold environment. The best available cells have an 88% reduction of capacity at 0°F. Most of the cells presently used in survival radios have a capacity reduction of approxi-

mately 85% at 32°F. It is important to note, however, that the capacity of the mercury cell will recover upon warming the battery.

Another severe limitation is the storage life of the mercury battery. Under temperature-controlled conditions (70°F or less), the battery has a shelf life of approximately two years. As the storage temperature increases, this life is diminished appreciably. For example, the shelf life is reduced to 6 to 10 weeks at a continuous storage temperature of 150°F. Finally, the cells emit hydrogen which tends to carry with it some of the electrolyte. After several such chemical reactions the electrolyte exhibits itself as a strong alkali (salt-like deposit) which is highly corrosive to, among other things, the aluminum casing.

NavAirSysCom is pursuing several battery development programs designed to alleviate these deficiencies but a major breakthrough is not yet in view. Certain precautions and field techniques can and should be employed to aid in ensuring that the batteries will function properly when put to use.

First, check the date of manufacture of the battery. Don't use batteries over a year old if known or suspected to have been stored improperly. Batteries over a year old should be replaced at frequent intervals if subjected to prolonged warm environment.

Second, ensure if possible that spare batteries are stored in an environment where the temperature is maintained at 70°F or less.

Third, if any salt-like deposits are exhibited on the battery, discard the battery. It is noted that a liquid deposit on the battery does not constitute cause for rejection; if wiped dry, the battery may be employed although it should be considered suspect and examined frequently for evidence of salt-like deposits.

Finally, there is available through ComFAirWestPac a battery tester, the TS-2530A/UR, for units in the WestPac area. This unit should be used to check every battery employed in a survival radio. At this writing this battery tester is not available in sufficient quantities to outfit all fleet activities. Measures are being taken to remedy this.

Radios and Beacons

The UHF radios and beacons described in this article have certain peculiarities which should be understood by users. Briefly, radiation patterns of a beacon during parachute descent are very unusual due to varying ground plane and shadowing/directional effects. However, the net effect is to increase effective range by a factor of 2 to 4 times. Once on the surface, the survivor can expect a large reduction in range. This reduction can be unsatisfactory if the antenna is not oriented in a vertical position. On the ground, with the radio antenna held in a vertical position, the antenna pattern is that of a donut with a very sharp null overhead. Another aspect of propagation that is very significant is the very large reduction of signal if the energy must pass through jungle foliage. Studies in this area indicate that an attenuation of 90 db. per tenth of a nautical mile can be expected in a typical jungle environment.

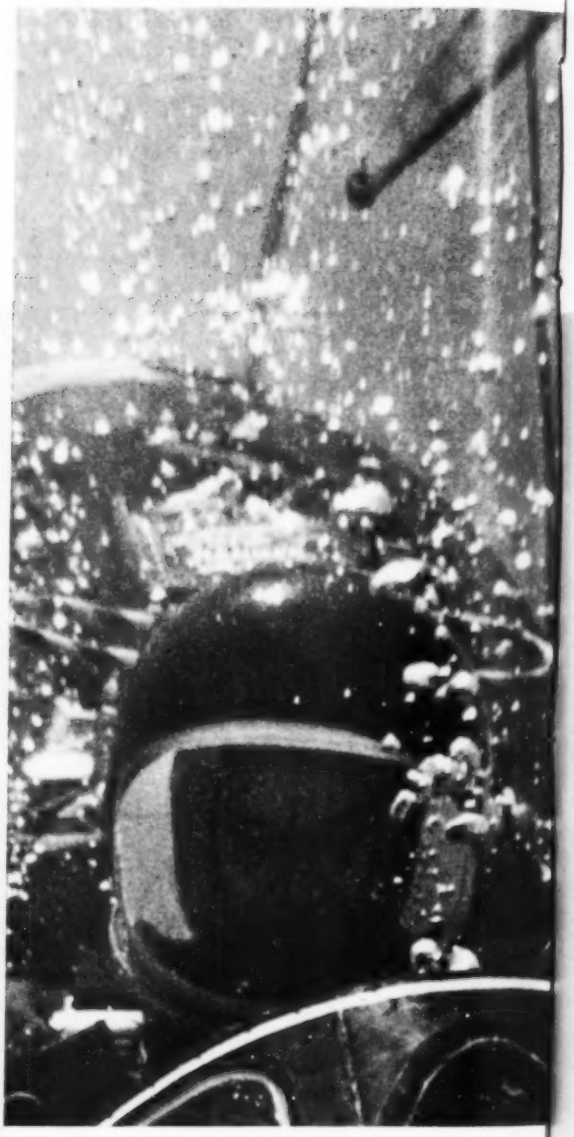
To sum up the salient points, the following advice is offered:

- First, on the ground, attempt to operate from a relatively clear area.
- Second, hold the antenna vertical and attempt to keep the radio at a height greater than 14″ off the ground.
- Third, if attempting to signal an aircraft at high altitude—5000′ or greater and nearly overhead, the antenna should be tilted slightly in a direction to place the edge of the hypothetical donut on the aircraft.

Conclusion

This article has been written to aid fleet activities in understanding the survival radio/beacon posture of the Navy. The information contained herein constitutes the best available inputs of cognizant contractors and activities and, while subject to change, is accepted with a high level of confidence. Action is now being taken to revise the NavAirSysCom 00-35QH-2 Allowance List and applicable Aircrew Systems Changes and Bulletins to reflect the introduction and application of equipment discussed here.

Activities having questions concerning any aspects of the survival radio/beacon picture should address their inquiries through channels of command to Commander, NavAirSysCom (Code: AIR-53341-B), Area Code 202 OX6-4512 or Autovon 22-64512. ◄



SCUBA and Naval Aviators

The hazards of ejection, descent, sea survival and rescue are well known to the naval aviator. This article warns of a hazard to aviators which has previously never been emphasized.

After an overwater ejection, with a standard parachute and normal descent, a man will sink 5′ to 15′ beneath the surface of the water and he will immediately resurface. If the aviator continues to breathe from his independent oxygen supply while beneath the surface of the water, he will be breathing from a scuba or self-contained underwater breathing apparatus. Although the aviator may be scuba breathing for less than 10 seconds, he will, nonetheless, be vulnerable to the same hazards as every scuba diver. The most frequent cause of scuba death is panic which results in pneumothorax (collapsed lung) and air embolization (air bubbles in the circulatory system).

Physics: The potential problems of scuba diving are numerous. Air embolization and pneumothorax are the most serious and most pertinent to the aviator who ejects over water.

Example 1: If a man swimming on the surface of the water (without a scuba) holds his breath and skin dives to 33′ beneath the surface, the volume of air in his lungs at the 33′ level will be one-half the initial volume measured at the surface. Conversely, as he ascends without exhaling, the volume of air contained within his lung will gradually increase to the original pre-dive volume.

Boyle's Law: $p_1 v_1 = p_2 v_2$
(pressure #1) (volume #1) = (pressure #2) (volume #2)
This is a mathematical description of the physical

By LT Robert C. Karlsberg, MC

HMM 361

Member, Nat. Assoc. of Underwater Instructors

principle that the volume of a given mass of gas is inversely proportional to the pressure applied to that mass of gas. In the case of the above illustrated swimmer:

p#1 = 1.00 atmospheres (MSL)
v#1 = 4,000 cc. (in lungs after maximum inspiration)
p#2 = 2.00 atmospheres (at 33′)
(1.00) (4,000) = (2.00) (v#2)
2,000 cc. = v#2

That is the volume of air in the swimmer's lung at 33′, if he has not exhaled, is 2,000 cc.

Example 2: Conversely, consider a scuba diver swimming at 33′; if he takes a deep breath of pressurized air at this depth and ascends to the water's surface *without exhaling*, what will be the volume of air in this scuba diver's lungs when he surfaces?

p#1 = 2.00 atmospheres (at 33′)
v#1 = 4,000 cc. (in lungs after maximum inspiration)
p#2 = 1.00 atmospheres (MSL)
(2.00) (4,000) = (1.00) (v#2)
8,000 cc. = (v#2)

The lungs would explode (pneumothorax) and the blood vessels would tear open permitting pressurized air to enter the circulatory system (air embolization).

Example 3: Finally, consider an aviator who has ejected and continues to breathe from his independent oxygen supply. After reaching the surface of the water, he may well sink to an arbitrary depth of 11′ (11′ = 1.3 atmospheres). If at that depth he inhales from his pressurized gas source, and *holds his breath* until he ascends to the surface, what is the volume of air in his lungs at the surface of the water?

p#1 = 1.3 atmospheres (at 11′)
v#1 = 4,000 cc. (in lungs after maximum inspiration)
p#2 = 1.0 atmospheres (MSL)
(1.3) (4,000) = (1.0) (v#2)
5,200 cc. = v#2

Pneumothorax and air embolization could easily occur.

Discussion: Pneumothorax and air embolization are lethal hazards to scuba divers and aviators. This problem has never before been stressed to the aviator. The pressurized oxygen system carried in the seat pan is an excellent piece of gear and can be used to scuba dive to a depth of 20′. As with any scuba, the diver must exhale while ascending to a more shallow level. With a conventional scuba, the diver need only relax while ascending; as the gas in his lungs expands, it will escape from his mouth. However, with a pressure breathing mask, a conscious effort to exhale must be made by the aviator as he ascends from his brief submarine voyage. Considering the rapidity with which the aviator resurfaces and the potential for panic, there is little doubt that the pilot may well hold his breath and valsalva while ascending. A pneumothorax and/or air embolization may result.

Recommendations: An aviator who has ejected should remove his oxygen mask when below 10,000′ and prior to contact with the water. (1) Make a forceful effort to exhale as he ascends and (2) remove his mask prior to ascending, if practical. Training for aviators should include the pertinent hazards of scuba diving. ◄

This packet of Southeast Asia Plant Recognition Cards (Device 9H12) is available under FSN 20-6910-918-8350. The plants are shown in full color; on the back of each card is descriptive data. Information on poisonous plants is printed in red. (The Naval Training Device Center has recommended that Cards 33 and 39 be deleted from the series.)

NOTES FROM YOUR FLIGHT SURGEON

Keys To Success

PRIOR training and practice on the part of SAR rescue team and survivors can contribute greatly to a smooth rescue. The following comments on the rescue of an F-4B pilot and RIO are a case in point. The SAR helo copilot describes the scene:

"An E-2A was orbiting the survivors. Approximately three miles from the scene we saw the E-2A as it flew over them and rocked its wings. At this point, we spotted dye marker which appeared as a slick on the water. About a mile out, we observed intermediate flashes from a strobe light. At this time we were in radio contact with the survivors who gave us a heading toward them. I believe this radio to be an invaluable piece of survival gear. The broken overcast and darkness limited our visibility so much that we were not sure where the survivors were until we were less than 100 yards away. The pilot in the water informed us that his RIO had an injured back and requested that he be brought aboard first. Our crewmen both did an outstanding job . . . both performed the rescue in a closely coordinated and professional manner even though this was their first."

Rescued RIO: "Prior training in deep water survival was most valuable in this situation . . . When I was hoisted out of the water on the seat, it would have been much more comfortable if I had been tied to it in some manner for it was quite painful holding on with my arms. (*Although there is no mention of it in this report, normally the rescue seat has straps which can be se-*

cured around the survivor. BACSEB 26-61 refers.—Ed.) The only comment I have to make is that it was getting dark and the helo had trouble seeing us when it did arrive on the scene. The survival radio eliminated this problem."

Rescued pilot: "It was a very smooth job and, actually getting into the helo was much less trouble than I had anticipated. Personally I was impressed by the work of all members of the crew. I could not have asked for a better rescue."

SAR helo pilot: "This rescue was a perfect sample of close coordination between ship, aircraft orbiting the scene and the rescue vehicle."

Training. . . practice. . .coordination. . . these are the keys to a successful rescue.

Sound Judgment

I AGAIN reiterate the sound judgment of a survivor keeping his hard hat on during the rescue sequence as there is a definite chance of his receiving head injuries upon entering the helo. This survivor kept his on *and* he did hit his head. (No injuries.)

—SAR Helo Pilot

Quarterly Theme

PERSONAL survival equipment was designated the quarterly theme by an area safety council. The need for continuous and constant emphasis in this area was brought to mind after an incident in which two crewmen had to bail out over water at night. They discovered their knowledge of the survival radio was insufficient under an actual night survival situation. What may seem clear and simple in a classroom, the council pointed out, becomes entirely different in an environment of darkness in an actual emergency situation.

Three Saves

IN a six-month period, one Air Group experienced three mishaps in which the cockpit of an aircraft was instantly filled with flying glass fragments. The first was caused by a bird strike on the wind screen, the second by a fuse cap falling from a lead aircraft which punctured the wingman's windscreen, and the third by an exploding fuel gage. In each of these incidents the pilot had his helmet visor down, a fact to which the Air Group attributes the aircraft save.

Habit Pattern

DURING a normal field entry and break for landing, the aft canopy of an F-4 was inadvertently separated from the aircraft by the RIO. The canopy separated as the aircraft decelerated to landing airspeed. Cockpit noise level increased but not enough to prevent pilot-RIO communications. The RIO stated later that the wind blast was not a problem (his helmet visor was down) and that there was no tendency for the ejection seat face curtain to be sucked into the slipstream.

How did the RIO "inadvertently separate the canopy"? He had made a practice of flying while at low altitude with his oxygen mask unhooked and the oxygen turned OFF. It was his custom to replace the mask and turn the oxygen back ON during the break prior to landing. In this case, he had his mask on and oxygen was flowing prior to the break. He feels that through force of habit he reached for the oxygen supply lever without looking and, instead, moved the canopy control handle aft to OPEN.

The squadron commanding officer had a few words on the subject: "This is a classic example of an incident that never should have happened. Non-compliance with NATOPS and squadron SOP requiring that oxygen masks be worn at all times in flight generated a habit pattern which led to complacency on the part of the RIO. Time and money involved in replacing the canopy, although substantial, is minor in comparison to potential mishaps which could result from this type of complacency."

In closing, the C. O. termed noteworthy the fact that the RIO readily admitted his mistake, thereby saving many manhours of investigation.

Noise Abatement

A NOISE abatement program aboard a CVS during around-the-clock operations has resulted in a noticeable increase in rest for aircrews due to the silence about the ship, the carrier's safety council reports. All unnecessary announcements, bells and bugle calls have been discontinued during around-the-clock operations. The only announcements made are smoking conditions and emergency or drill procedures.

Tape Does It

AN A-7 pilot who had to eject over water at night was not carrying a strobe light although, it was reported, he was aware of this deficiency and was planning to obtain one soon. In this case, investigators stated, that decision was one flight too late. (He had a pencil flare kit and two Mk 13 Mod 0 flares but was so preoccupied with other problems in the water that he did not use them.)

As the situation developed, it was the reflection from the tape on the survivor's helmet floating near him that located him for the SAR helo crew in a search using helo floodlights.

The investigating flight surgeon recommends frequent inspections of pilot's individual survival equipment.

During the preflight brief of a strike control/airborne early warning mission, it was agreed that the copilot, who was not night carrier qualified, would take the controls of the E-2A if there was still enough daylight when they returned to the ship. Mission completed, the copilot switched seats with the pilot and began a normal approach to the carrier. (To simplify things we will, from here on, call the launch pilot, the copilot and the launch copilot, the pilot.)

'. . . and the deep blue sea.'

At less than one-half mile from the ship, the aircraft began a pronounced right to left drift. On landing, the number 2 cross-deck pendant was engaged 28′ left of center line and rollout further to the left continued. As the aircraft reached the deck edge, it rolled over the side and broke up into three pieces as it fell into the ocean. The larger section of the fuselage containing the cockpit was at a 30-degree angle to the water, nose down on its back. Less than a minute later as it sank further it began to point straight up. It was now 18 minutes after sunset.

The copilot egressed through his upper escape hatch. The combat information center operator (CICO) and the radar operator (RO) escaped through the aft end of the fuselage in the vicinity of the third after station where the tail section had separated. The pilot and the air control operator were both lost.

Here are the post-crash experiences of the three survivors:

Copilot: The copilot does not remember hearing the aircraft breaking up or feeling any significant impact with the water. He tried to brace himself by reaching forward but he could not reach the instrument panel. As the plane went over the side, Dilbert Dunker techniques flashed through his mind. He was confident he would get out of the airplane.

Although the cockpit filled as soon as the fuselage hit the water, there was still enough light to see objects fairly well. For a few seconds the copilot "gathered his wits and looked around." It looked to him as if the pilot had released himself from the seat but he had apparently used the main equipment release handle because he had the parachute and seat pan still attached to his torso harness. This was the last time the pilot was seen.

Automatically, the copilot reached for the seat belt used in the Dilbert Dunker, a seat belt that is not present in the E-2A. Realizing this, he then methodically unplugged his mike cord and, using both hands, released his shoulder rocket jet fittings. Then he tried to release his leg fittings.

"I couldn't free the leg fittings because I was hanging in my straps," he recalls, "so I took hold of my seat with my left hand and pulled myself back into it. After doing this, I had no problem freeing them." (All of the survivors released their upper rocket jet fittings first, then the lower ones; all had trouble with the lower ones. In the copilot's instance, strapping in more tightly might have prevented this situation.)

Once free of the seat, the copilot felt around for the brace across the rear of the hatch to locate the overhead escape hatch handle. Opening the hatch, he reached out with both hands and pulled himself out of the sinking aircraft. He did not inflate his flotation gear for fear his life preserver would buoy him into the underside of the sinking wreckage and trap him. Instead, he swam out and up until he surfaced, then pulled the toggles. Just as he reached the trailing edge of a wing flap and part of the fuselage, the wreckage sank; he had to push himself away to avoid being hit. He saw the CICO and RO about 40 yards away. A helicopter was approaching. Hold-

Continued next page

ing on to a vertical stabilizer floating flat on the surface of the water, he drifted under the rescue helo. The crew lowered the sling directly in front of him; he had no trouble getting into it and was hoisted aboard immediately. On the way up he bumped his hard hat on the helicopter.

The copilot states that when he escaped from the wreckage, the plane was vertical, nose down in the water. He describes himself as a good swimmer but says that his failure to get a good breath of air before going under water caused him to "suck water all the way up." He reports that his gloves were wet and slippery but because they fit tightly they presented no real problem. During his interview with investigators he commented, "I firmly believe that if I had never been in the Dilbert Dunker I would still be in that airplane."

Radar Operator: Following the hard landing aboard ship, the radar operator had just turned to secure his radar gear. When he turned back forward, the plane was "screaming and tilting to the left." As the aircraft nosed over, one or more hydraulic lines near his seat broke, spraying him with fluid. When the plane came to rest he was inverted and covered with hydraulic fluid.

"The smell of the fluid was overpowering and all I could think of was the possibility of fire," he recalls.

He released his shoulder fittings, then tried to locate his lap fittings.

"The right fitting was so difficult to find and release that I was sure the aircraft was going to burn before I got out. The left lap fitting infuriated me. I flailed around until I found a purchase for my feet and pushed myself back into the seat. After releasing the pressure on the catch, the fitting came loose easily. My orientation was bad but I must have stood on the circuit breaker panel. I was surprised to see a large hole and water. Someone, I assume it was the CICO, was climbing out of the plane in front of me. He stepped upon a large square structure with one foot and his other foot caught in some steel cables. I reached out and freed him."

The RO stated that he knew the lap fittings would be hard to release since he had read in APPROACH an account of an instance in which this had happened; therefore he expected difficulty and did not panic.

After their escape from the wreckage, the RO and the CICO were standing side by side on the aircraft. The RO recalls he wanted to jump into the water but the wing and engine were below him. As the aircraft did a violent flip to nose down, both men were thrown into the water. He went under and pulled both life preserver toggles. He discarded his leather flight gloves which he said felt 10 sizes too big and made of bacon fat. Then he turned on his strobe light. The RO could not reach his pencil flares or shroud cutters because the inflated Mk-3C covered his survival vest. He was able to reach his survival knife which he carried on his right leg.

After the plane sank, the RO could not see the copilot. Because of the rotor wash, the only way the RO could observe the helo was to face away and look through his helmet visor over his shoulder. This kept the spray out of his eyes and he could tell when to turn and pick up the rescue sling.

Combat Information Center Operator: As was the case with the copilot and the RO, the CICO had felt no discernible impact with the water as the E-2A hit the sea. The aircraft broke up right behind his seat. Only sky was visible from the side windows, he recalls. Something heavy was pressing him down; he either pushed it away or it fell away.

At first, he thought the aircraft was hanging from the flight deck. His seat broke loose, facing forward and leaning on its side. He released his shoulder fittings, forgot one leg fitting but then "got it loose O.K.," and crawled aft to the large opening in the fuselage. The front end of the aircraft was "all black."

The CICO cut his left leg on a piece of flooring and his left hand on a jagged edge of the broken fuselage. He also sustained cuts on his left shoulder. As he climbed out, he noted that his flight boots with their heavy rubber cleated soles provided good traction on the oily overhead of the aircraft.

After he jumped into the water the plane started to submerge and began to pull him under.

"It was difficult to pop my CO_2 toggles in the Mk-3C because I was trying to swim away from the sinking aircraft, but the life preserver inflated and I rose to the surface. I turned on my strobe light and tried to locate my flares. The RO and I were holding on to each other. I grabbed the sling on the helo's third pass and the RO helped me into it." The CICO, too, bumped his hard hat getting into the helicopter.

On the subject of survival gear and procedures, the board's recommendation was that crews be briefed and be required to practice releasing the lower torso harness fittings first in a ditching situation. ◄

Are you and your personal equipment ready for an emergency?

AIRCRAFT ACCIDENT REPORT
OPNAV FORM 3750-1 (Rev. 3-63) Page 1

SPECIAL HANDLING REQUIRED in accordance with Para. 66, OPNAV INSTRUCTION 3750.6, effective edition

OPNAV REPORT 3750-1

PART I GENERAL

1. AIRCRAFT ACCIDENT BOARD APPOINTED BY	2. SERIAL NO.	3. DTG (LOCAL) OF MISHAP	4. MODEL AIRCRAFT	5. BUREAU NUMBER

6. LOCATION OF MISHAP

Modern aviation has progressed so that safe aircraft are now being built. If they are maintained and used as designed, mishaps should, theoretically, not occur.

Do Not Compound the Aircrews' Problems

SECTION B. CONTRIBUTING FACTORS

*	✓	FACTOR	✓	FACTOR	✓	FACTOR
		1. PILOT ERROR IN TECHNIQUE/JUDGMENT		9. SERVICING PERSONNEL		17. WEATHER
		2. PILOT DEVIATION FROM NATOPS PROCEDURES		10. LANDING SIGNAL OFFICER		18. DESIGN AIRCRAFT
		3. PILOT INCORRECT OPERATION OF A/C SYSTEM		11. OTHER PERSONNEL *(Specify)*		19. DESIGN CREW EQUIPMENT
		4. PILOT OTHER *(Specify)*		12. ADMINISTRATIVE		20. DESIGN OTHER *(Specify)*
		5. CREW		13. FACILITIES-RUNWAY, OVERRUN TAXIWAY, FLIGHT DECK		21. ROLLING/PITCHING DECK ROUGH SEAS
		6. MAINTENANCE PERSONNEL		14. FACILITIES-NAV AIDS, LANDING AIDS (GCA, CCA, ILS, MIRROR)		22. MATERIAL FAILURE/MALFUNCTION
		7. MAINTENANCE SUPERVISORY PERSONNEL		15. FACILITIES-CATAPULT, ARRESTING GEAR *(Ship or field)*		23. UNDETERMINED
		8. SUPERVISORY OTHER *(Specify)*		16. FACILITIES OTHER *(Specify)*		24. OTHER *(Specify)*

Unfortunately, the theory stated above is unworkable because of the human tendency to make mistakes. In the final analysis, most of the accidents and incidents we read about are caused by people.

One can see by Figure 1 that contributing factors in mishaps are divided into 24 different categories. At first glance, one might say that factors such as 17—weather, are not caused by humans. Indirectly, however, they are because people either let themselves get caught flying in bad weather or they wilfully elect to venture into it. If a mishap occurs then, one or more of the other 23 factors is brought into focus.

Our aim is to better acquaint maintenance per-

sonnel with the airborne aircraft mishap cause picture so that their own responsibilities will come into more accurate and realistic view. Many of these accidents/incidents are originally triggered by maintenance factors compounded by aircrews taking the wrong course of emergency action. Hence, box No. 1 frequently gets a check mark along with some others.

Many wrong attempts at corrective action by air crews are committed because the men are handicapped by being airborne with limited time at their disposal. Maintenance personnel, however, do not have such restrictive excuses. It is common knowledge that maintenance men often find themselves in situations such as insufficient work time allowance, bad working conditions, improper tools, old equipment and even unreasonable supervisors breathing down their necks. By bringing up all of the circumstances surrounding the mishap, it is hoped that maintenance men will recognize the importance of adhering to standing maintenance guidelines.

To illustrate, let's look at some accidents in which it has been clearly established that a maintenance factor triggered off the chain of events.

Big Trouble From Two Screws

Upon completion of a scheduled hop, an A-4B pilot made a routine landing. After turning onto the taxiway, he added power to move along toward his squadron parking area. When taxi speed seemed adequate, the pilot eased back the throttle and, much to his surprise, the engine continued to increase its RPM. While applying brakes, the pilot wiggled the throttle in the IDLE detent but the engine power kept winding up until it stabilized at 87 percent.

Recognizing that he had a runaway power plant, the pilot saw no alternative but to shut down the engine and he quickly informed the tower of his intentions. Unfortunately, placing the throttle in CUT-OFF did not deter the unwanted thrust. Although not handicapped by being airborne with limited time, the pilot was getting perturbed and slightly excited by the unusual situation so he grabbed the emergency fuel shut-off lever. It did not seem to work properly and then the pilot realized that, in his excitement, he had moved it inboard instead of outboard. Then the lever stuck and the pilot was able to move it only halfway back. Oblivious to all this, the engine kept running along at 87 percent.

Meanwhile, maximum braking action was insufficient to check the now accelerating *Skyhawk*. It raced off the pavement, crossed a grass plot and struck a dirt fuel bunker which collapsed the nose and starboard MLG. During its final 90′ of travel, the port MLG also gave away. Fortunately, the pilot was not hurt, but the aircraft received major damage. The engine quit at about the time of impact, which would indicate that the pilot did the right things but that time was against him.

The board checked items 6, 8 and 22, because investigation revealed that maintenance personnel had not done their job properly. The throttle linkage had separated because two safety screws had come loose which allowed the throttle linkage to disengage. *The matter was traced to a direct violation of scheduled maintenance instructions.*

Faulty Design Uncovers Questionable Maintenance Practices

An RA-5C accident seems apropos to this article because the board felt that faulty design was the basic cause but maintenance also got into the act. Following touchdown on a routine carrier trap, observers noticed blue smoke coming from the upper portion of the port MLG. On the runout, the port MLG slowly gave way allowing the port wingtip to contact the deck as the *Vigilante* came to a full stop. No one was hurt and damage was minimum.

The board determined that the landing weight was 1300 lbs below maximum and that the gear was not subjected to its design limits. Considering that there had been an unusual amount of similar MLG failures on the *Vigilante*, faulty design of the upper main barrel assembly of the gear was considered to be the primary culprit. The maintenance crew was charged with an error because the strut was inflated

The *Vigilante*'s shattered strut.

An egg-laying helicopter.

with air vice nitrogen as specified. But the gas substitution was not proven to be the cause of barrel failure. Nevertheless, box 6 got a check along with 20 (faulty landing gear design) and box 22. *(For a better understanding of the effect of air in struts please see, "The Big Switch from Air to Nitrogen," May 68* APPROACH*—Ed.)*

Who Laid the Egg?

A maintenance error in the control system of an SH-3D set the stage for its final and shortest hop—23 seconds. The *Sea King* pilot lifted upon receiving the signal from the LSE. Almost immediately after liftoff, the aircraft became unstable in roll and pitch; oscillating left to right; nose up and down. The oscillations became progressively large reaching about 10-15 degree bank to the right and left while the nose varied from 5-10 degrees up and down. Upon reaching a hover altitude of 13′ above the flight deck, the helo yo-yoed several times and then bounced its tail wheel on the deck. On the second deck contact, the tail wheel collapsed and the aircraft began to roll to the right, crunching the wingstub sponson assembly into the deck. Continuing without the starboard MLG the helo contacted the deck followed by the three main rotor blades sequentially striking the surface. Then the tail pylon failed, folding sideways. Thrashing and heaving continued until power was secured and a thoroughly bent bird came to halt.

Investigation revealed that the aux servo had been changed a month prior to the accident and a series of 26 control discrepancies had been written up since that time.

Maintenance error was assessed in that the aux servo unit was not aligned with the ASE originally. Maintenance error continued in the course of writing off 26 successive control gripes with no one diagnosing the misalignment of aux to ASE. Consequently, boxes 6 and 7 each got a big check.

Tailpipe Clamp Goof

In the course of performing aerobatics, an A-4C pilot in a slight dive at 100 percent rpm detected a slight thump from the after fuselage simultaneous with a mild rudder shake. A moment later the fire warning light illuminated. He leveled the *Skyhawk* and reduced power to 80 percent for easier investigation. All other instruments were normal but the red light persisted. Another *Skyhawk* flew alongside and the pilot reported no sign of fire or any other visible discrepancy. A precautionary approach was made to home base and the plane was landed safely into the E-15 gear.

At the end of pendant runout, the pilot secured the engine and got out. As the crash crew gathered around, smoke was detected coming from the aft section which turned out to be burning electrical wires. By the time the stubborn fire was put out, the *Skyhawk* received Bravo damage.

The basic cause of the trouble was found to be that the starboard trunnion had been left out of the

clamp assembly for securing the tailpipe. The whole job was considered to be improper in that: (1) An oversize spacer was installed which, when butted against the clamp, allowed the clamp to be temporarily and "apparently" assembled and torqued and; (2) The tailpipe clamp assembly was installed upsidedown with the bolt threads pointing in a clockwise rather than the prescribed counter-clockwise direction.

Hot gases rather than open flame leaking from openings in the loose tailpipe set fire to the electric wire shielding. This, in turn, buckled the lox compartment and then the heat burned the converter.

The checks for this mishap were confined to boxes 6 and 7. This rather glaring maintenance error could have led to a fatal accident. It generates some thinking about how many checks in box 23 (undetermined) might have had related causes.

Box 23—Undetermined

In most all of the previously mentioned cases, the aircraft made safe landings so that the exact malfunctions could be determined. Here is a mishap wherein only box 23 was checked. Regardless of the "undetermined" classification, there is strong suspicion of lax maintenance and/or faulty design.

Two *Crusaders* blasted off on a scheduled cross-country. As he passed through FL-440 in MRT indicating Mach .86, the wingman observed the lead F-8A emit a momentary large stream of fire from the tailpipe. Immediately following this, the aircraft was observed to decelerate and the contrail disappeared.

The lead pilot instantly recognized his flameout condition and to compound the problem, the inside of his canopy frosted over. Then, trying to inform his wingman of the situation, he discovered that his radio was dead. Recognizing that the flameout indicated electrical failure, the pilot correctly extended the emergency power package and commenced relight procedures.

A number of airstarts were attempted in both normal and manual fuel control as the *Crusader* made like a glider. The wingman could detect each relight attempt because fuel vapor would come out the tailpipe followed by flame (torching) and then—nothing.

Meanwhile, all gages read normal to the pilot except the EGT which was always abnormally high (around 900° C.). The engine windmilled at about 25 percent and never increased measurably with the many relight attempts.

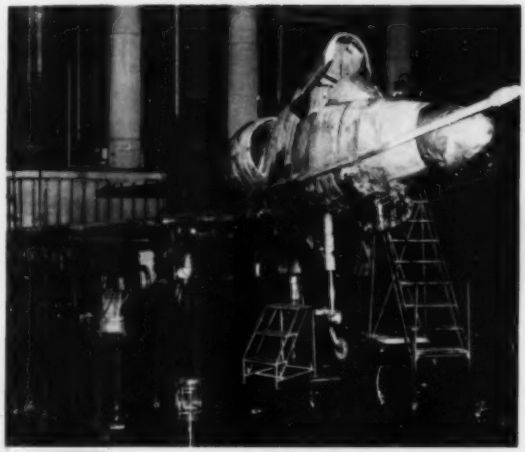
The pilot ejected at about 3500′. Everything worked as advertised and the man parachuted to earth unharmed. The aircraft was a total loss thereby making it impossible to diagnose the exact cause of the trouble.

The records are full of mishaps which were caused or suspected to have been caused by faulty maintenance. As stated earlier, it is human to err, therefore standing operating procedures in the form of inspection requirements backed up by quality control inspections were devised to make up for such shortcomings. To short-cut these procedures inevitably compounds the error into a major problem for the aircrew. ◄

Engine failure demolished this *Crusader*.

NOTES

and comments on maintenance



Inattention to hazardous conditions caused this.

Faulty Electrical Equipment Starts Fires

AN A-4C was being put through the PAR phase of paint stripping. After trying to remove the paint and primer from the wheel well areas, it was concluded that Mil-8633A was not good enough for a satisfactory job. Consequently, the supervisor directed the men to try acrylic thinner Mil-T-19544. The men performing the work had more enthusiasm than experience and a considerable puddle of the thinner soon collected on the deck under the *Skyhawk*.

Before the job could be finished, the electric explosion proof light used for illumination failed. Accordingly, the light assembly was returned to the nearby workbench and a floor floodlight was put in its place. At about this time, the discarded light mysteriously relit while lying on the bench. Since it was considered to be the better source of illumination for the job, the men retrieved the original light and laid the substitute on the deck, unfortunately, still connected to a power source and still turned on.

The spray job had hardly recommenced when the substitute lamp burst and immediately ignited the flammable vapor from the puddle of thinner on the deck. A few seconds later the airplane was engulfed in flames and by the time the holocaust was brought under control, the A-4C had received Bravo damage. The following recommendations evolved from this accident:

a. The stripping of paint be accomplished by using the prescribed materials as indicated in Cleaning Manual, NavWeps 01-1A-506.

b. Any deviation from the procedures or materials indicated for use in NavWeps 01-1A-506 should be only as specified by competent authority.

c. If a deviation from standard is necessary such deviation be allowed only to satisfy the needs of a single particular job.

d. The use of materials other than standard when authorized be emphasized as a special application for a special job. This emphasis for the purpose of eliminating somewhat the possibility of establishing a work habit through exception.

e. Sufficient attention be given to the maintenance of good shop equipment to prevent the use of unsafe equipment.

f. Support maintenance shops provide only completely repaired equipment for the production shops.

g. Preventive maintenance inspections be scheduled, consistent with the use, for all portable electrical equipment used in hazardous areas.

h. Additional training in the area of fire safety be provided for all employees with special emphasis toward the new employees.

i. Safety inspections be accomplished in the hazardous areas frequently enough to monitor possible changes in work procedures, equipment changes, and employees' state of training in respect to their particular work.

j. When a substitute hazardous material is authorized in lieu of a nonhazardous material the authorizing agent shall be responsible for informing all of the line supervision of the hazardous properties of the substitute material prior to its use.

1 cm (centimeter) = 0.39 in.

1 cu or 1cc (cubic centimeter) = 0.000001 m^3 = .0610 cu in.

1 ml (milliliter) = 0.001 liter = 0.06 cu in.

1 mm (millimeter) = 0.001 m (meter) = 0.04 in.

1 l (liter) = 61.02 cu in = 0.908 qts (dry) 1.057 qts liquid

1 dm (decimeter) = 3.94 in

1 kg (kilogram) = 1000 grams = 2.2046 lbs.

1 sq cm or cm^2 = 0.0001 sq m = 0.155 sq in.

1 ca (centare) = 1 sq m = 10.76 sq ft.

1 g or gm (gram) = 0.035 oz.

METRIC SYSTEM STUDIED

Feasibility of engineering and producing the U. S. Air Force's *Maverick* air-to-surface tactical missile using the metric system of weights and measures will be determined by a study contract awarded North American Aviation's Columbus Division.

Adoption of a metric approach would represent one of the first major applications of a basically European system of weights and measures to a weapon originated by the United States.

A $650,000 contract was awarded recently by the USAF Aeronautical Systems Division to perform the study.

Use of the metric measurement system on a wide scale in future armament design could greatly facilitate joint development efforts by the U. S. and its NATO allies who employ metric measurement units exclusively.

A metric changeover would also have the effect of improving joint logistic support and widening the scope of commonality in Free World armament design and use.

Purpose of the in-depth study is to determine the economic feasibility of engineering the *Maverick* missile from beginning to end in International Standards Organization units.

If the Air Force elects to proceed with the *Maverick* program under the metric approach on the basis of the study results, only units such as grams and meters would be employed in the *Maverick*'s development, instead of the familiar English standards like pounds and feet.

The study will encompass scaling the missile entirely in metric units, starting with the smallest subcontractors in their production of nuts and bolts, and ending with the complete missile assembly.

All production machines would have to utilize metric measurement scales. Inspection tools would have to be scaled to metric units.

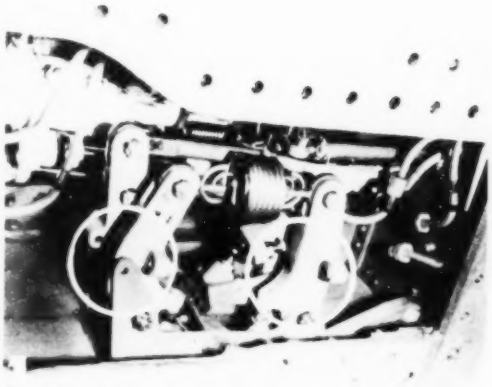
Metric units would be used throughout the engineering and production phases with the *Maverick* using the system from the ground up. It would not be a simple translation of dimensions from English to metric units.

The *Maverick* is designed for use on F-4 fighter-bombers and on the F-111. The conventional warhead, television-guided weapon is designed to destroy military targets in interdiction and close-support operations under visual conditions.

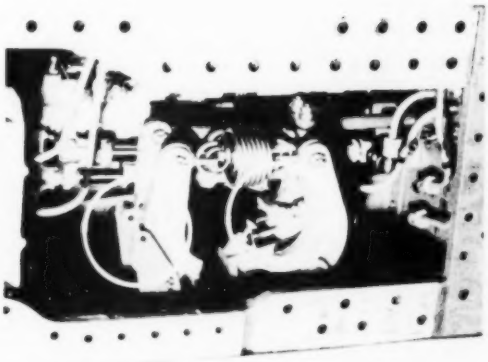
The Air Force also awarded a similar contract to Hughes Aircraft Company of California. Both companies have been involved since last September in early development of the *Maverick*. One of the two companies is expected to receive an Air Force go-ahead early this year to complete development and produce the *Maverick* missile.

MURPHY'S LAW*

A-7A Roll Feel Spring Arm Murphy



Reversed installation: Arm at left should be at right and vice versa.



Correct installation: Note stops on both arm assemblies positioned inboard.

On calendar inspection of an A-7A, mechanics discovered that the control stick would not automatically center after displacement to the right or left.

Investigation revealed the roll feel spring and arm assembly was installed backwards, allowing normal spring tension to be by-passed. See photo 1.

The assembly was installed just before the aircraft calendar check. Although the controls were cycled following the installation, this discrepancy went unnoticed until the controls were cycled again during this inspection.

A-7 maintainers should be alert for this Murphy situation. The correct installation of the roll feel spring and arm assembly is shown in photo 2.

—Contributed by VA-174

*** If an aircraft part can be installed incorrectly, someone will install it that way!**

The Struggle for Efficiency

After World War II numerous study and statistical-gathering groups gleaned detailed facts about the war. One shocking observation they uncovered was the appallingly inefficient way we won it. As far as naval aviation was concerned, the facts indicated that pilot utilization could stand considerable improvement.

In regard to aviator employment, there had been no central compilation of each aviator's exact qualifications. There was the Blue Book that showed which officers were pilots but it contained no additional aeronautical information. Then there was the individual fitness report file, but there was no place there for aviation accomplishments. Every pilot had his individual log book but that always stayed in his possession (or in his squadron operations office). A dual set of books on each pilot kept at a central location was obviously the hard way. The answer seemed to be some sort of yearly report from each pilot on his flying currency. Hence, toward the end of the Korean War, the first individual flight time report (IFTR) became mandatory.

One of Many Examples

Early in the Korean War, a form similar to the IFTR could have made operations more efficient. As an example, some *Panther* jet squadrons were ordered into action and since such jets were new to the naval system, the assigned pilots were retrained in the F9F-2s. No one seemed to care that one of the selected squadron commanders had no VF experience. The end result was that after the first few weeks in Korea, the C. O. had to be replaced because it became quickly obvious that he "could not cut the mustard." The remainder of the squadron had to be given some realigned training.

Experience and Currency Can Be Different

Mishaps are not narrated to embarrass people but to teach a safety lesson and sometimes prove a point. If the spirit of the IFTR had been adhered to recently, a very unfortunate accident would not have occurred. In this case, a senior pilot with a great deal of experience (over 4000 hours) had let his currency lapse in a model aircraft he desired to take on a long cross-country. In the last five years he had accumulated just under 100 hours in the model but he had only flown it 0.8 hours in the last six months and 8.0 hours in the last year.

On the third landing, the pilot experienced a hydraulic failure. Ultimately, he landed wheels-up and very hot because he forgot *how* to actuate the emergency systems.

There is every reason to believe that this accident would not have happened had some higher authority ordered a check of the pilot's IFTR. Of course, this could also be a lesson to all pilots to always personally make sure they are current as required by NATOPS in any type or model aircraft before "signing for the bird."

Computers Get in the Act

In spite of a few slip-ups about currency, the IFTR has been a very useful tool. Now, however, a study of computer availability demonstrates it is time to modernize the IFTR. Accordingly, Figure 1 will replace the old IFTR beginning 1 July 1968. Thereafter, Figure 1 will be filled out for pilots and NFO's after each flight. Then, anytime it is desired to check on a man's flight status, the computer will provide the information by programming the individual's collection of Card Code 77s.

Moral—Keep Current and—Live.

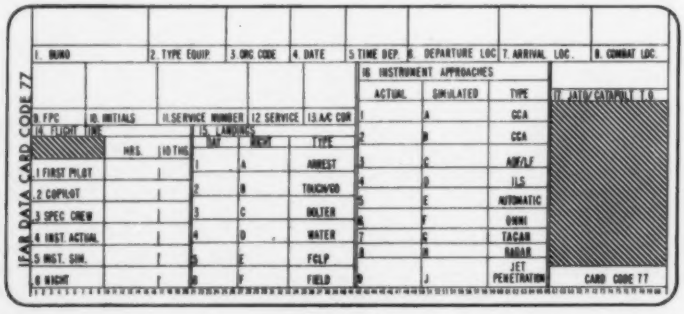


Figure 1

Letters

Strobe and Vertigo I

NAS Imperial Beach—I would like to comment on the item, "Strobe Light," concerning SAR helo vertigo, in the Forum section of the February APPROACH:

I have had approximately 1000 hours' time in the SAR type helo and in my experience the strobe light is the best thing that we have got. I find that the light from a constant source like a flare is much more apt to cause vertigo than the flashing light of the strobe. One other advantage of the strobe is that a helo pilot can estimate more accurately how far away the light is than was possible with previous lights and flares. The situation of a night rescue without any moon is always right on the verge of vertigo anyway and to complain that the strobe causes vertigo is not a fair comment on the best system that we have (unless you want to use star shells to light up the area!).

In all fairness I must add that I speak as an H-2 pilot. In the H-3 I am not qualified to comment.

LT R. R. REYNOLDS
ASO

• Thank you for your comments on the effects of a flashing strobe light on SAR helo pilots and crew. For another helo pilot's views, see the letter below.

Strobe and Vertigo II

NAS Imperial Beach—I noted the comments of "Interested Mouse" in the Forum section of the February 1968 APPROACH and since there is interest in the effect of a strobe light in rescue, I am enclosing comments on an actual night combat rescue. In the remarks section of the Rescue Report, OpNav 3750-13, my comments were as follows:

"The development of a personal survival light with both a constant and a strobe capability would be an advantage. It should have a directional capability also in order to attract attention from a specific direction. The standard omni-directional lights now used give the position to the enemy as well as our own forces. The strobe light, though giving a very bright flash, is much more difficult to hover over than a constant light and was quite unnerving in this rescue."

LT J. L. MEILING
HC-5

• The ACR Electronics Corp., which manufactures the ST-5E strobe, states that to change the present configuration of the strobe light to make it also burn steadily would decrease its intensity to a significant degree. As for directional capability, ACR has a flash guard which slips over the strobe and gives it directional capability. This item has been bought by the Air Force under FSN 6230-917-6692 but has not been bought by the Navy.

When acknowledging the two letters above, the survival editor put the two writers in touch with each other. The following amplifying information was subsequently received from LT Meiling:

"Both rescues took place at night and both were successful in picking up the survivor. I commented on the strobe light being very unnerving and difficult to hover over and LT Reynolds stated he had no problems at all. The primary difference in this is that LT Reynolds was using not only the regular red and green lights and the rotating beacon but also the high intensity hover lights. This evidently threw a tremendous amount of night lighting into the area and the result was the strobe light was not noticed as being too intense. On my rescue, being in enemy waters, and only a short distance from enemy gun positions, I was not able to use any aircraft lights at all so the rescue was under a different condition completely.

"I will be interested in reading comments from others concerning strobe lights."

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request.

Address: APPROACH Editor, U. S. Naval Aviation Safety Center, NAS Norfolk, Va. 23511. Views expressed are those of the writers and do not imply endorsement by the U. S. Naval Aviation Safety Center.

Vertigo and Anxiety

New Haven, Conn.—I was pleased to see my article "Vertigo and Anxiety" published in APPROACH (February, 1968 issue). As I have had some requests for this article, I would appreciate at least a dozen copies or tear sheets for this purpose and for my records.

As usual, the format of the article was excellent; I have always thought that APPROACH was one of the most tastefully prepared military publications I have ever seen.

Thank you again, and if there is anything more I can do for you please contact me.

GARY J. TUCKER, M.D.
ASSISTANT PROFESSOR
SCHOOL OF MEDICINE
YALE UNIVERSITY

• Thank you for your kind words about APPROACH. Art Director Robert Trotter was the man behind the "Vertigo and Anxiety" layout. He and Illustrator Blake Rader design and carry out the entire art production of the magazine from idea to paste-up. The tear sheets of your very fine article are on the way.

"Night In The Jungle"

Mather AFB, Calif.—I thought I'd let you know that the February issue of APPROACH was, in my opinion, an exceptionally fine one. Particularly praiseworthy is the article entitled "A Night in the Jungle." I can't remember when I've seen a more interesting safety-slanted survival story. While holding the reader's attention, a lot of good pointers are given on SEA jungle survival. I also thought that the safety comments were interjected in a most skillful manner. Again, congratulations on a most excellent issue.

MAJ JOHN A. HUDSON, USAF
EDITOR, THE NAVIGATOR MAGAZINE

• Your comments as a military editor are especially valued by the staff. Most of the credit for "A Night in the Jungle" must go to the pilot and bombardier-navigator on whose narrative accounts this article was based.

Vol 13 **approach** No 12

Our product is safety, our process is education and our profit is measured in the preservation of lives and equipment and increased mission readiness.

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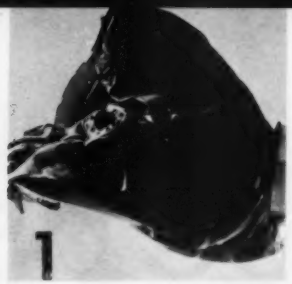

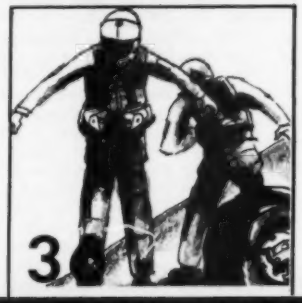

NavAir 00-75-510

CREDITS

Cover painting by Stan Cox shows the VHZL demonstrating its life saving capabilities, courtesy Kaman Corp., Bloomfield, Conn.

Pg. 24-25, Photos by PH1 William Roberts

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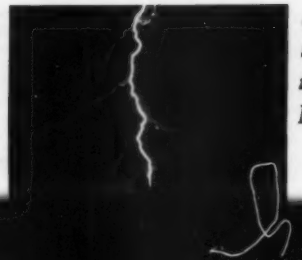
Next Month The Thunderstorm



and other items of interest to the Naval Aviator.

CREED FOR SAFETY

We believe . . .

• that no man lives or works entirely alone. He is involved with all men, touched by their accomplishments, marked by their failures. If he fails the man beside him, he fails himself and will share the burden of that loss. The true horror of an accident is the realization that a man has failed himself—and more—that his fellows have failed him.

• that accidents are conceived in improper attitudes, and born in moments of action without thought. They will cease to be **only** when the proper attitude is strong enough to precede the act—when the right attitude creates the awareness that controls the act.

• that the prevention of accidents is an objective which crosses all levels of rank, organization and procedure.

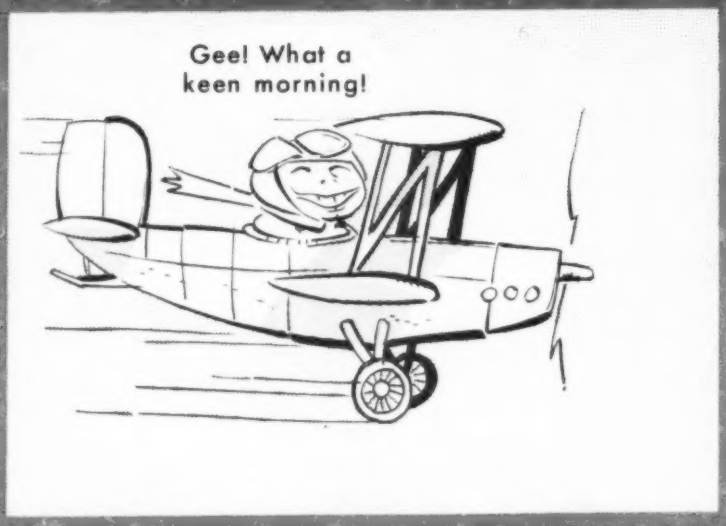
• that freedom from harm is not a privilege but a goal to be achieved and perpetuated day by day.

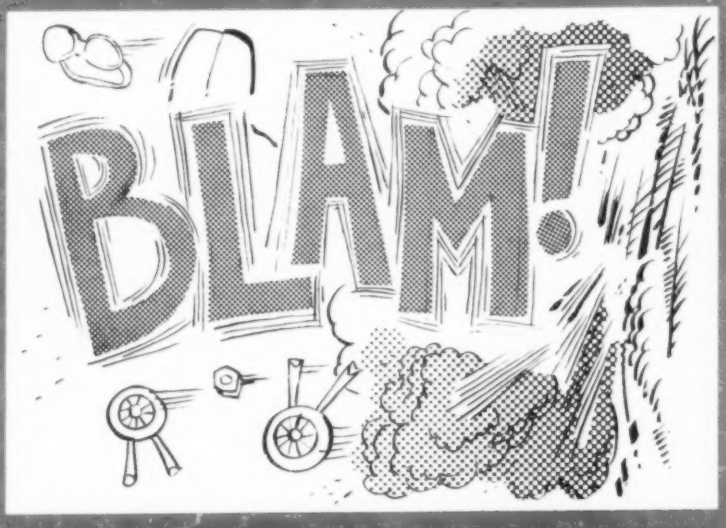
• that the elimination of injury and pain through accidents is a moral obligation upon which the final measure of our performance directly depends.

American Society of Safety Engineers

LIFT and DRAG

Contributed by LT T.A. Myers, ASO, V[illegible]-21





Some days it doesn't pay to even preflight the thing. . .

Especially if you don't look where you are going